Doctoral Degree Thesis

Effects of case studies and concept maps on improving critical thinking skills and dispositions in Indonesian college students

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Abstract

Promoting critical thinking abilities in students has been the focus of the educational field in Indonesia. Therefore, the education system needs to initiate methods that can facilitate critical thinking skills and dispositions. The present study attempts to add to the knowledge of how to develop critical thinking skills and dispositions through case studies and concept map activities in the introduction to psychology courses in an Indonesian college. Experiment 1 examined the effect of case studies and concept maps. Three groups participated in eight weekly classes of identical objectives. The groups differed in terms of the educational strategy: case studies combined with the concept maps (CSCM) group discussed about cases (case study) related to the class contents and they used FreeMind software to visualize the concept maps they made during the case studies. The case studies (CS) group conducted a case study in each meeting but did not use concept maps. The control group received a regular lecturing class without any active learning methods. All groups received a pre-test and post-test assessment of critical thinking skills by The Cornell Critical Thinking Level Z and also the critical thinking disposition by the University of Florida Engagement Cognitive Maturity and Innovativeness assessment (UF-EMI). The results showed that critical thinking skills improved significantly more in the CSCM group than in the CS and the Control groups. All groups showed significant improvement in critical thinking dispositions but with no significant differences among the groups.

Experiment 2 examined effects of preparatory training for a case study activity in addition to CSCM and CS treatments. The results showed that critical thinking skills improved significantly more in the CSCM group than in the CS with preparatory training, the CS without preparatory training, and the Control groups. Inconsistent with Experiment 1, two CS groups showed significant improvement of critical thinking skills compared to the Control group in Experiment 2. Further analysis showed that case studies without concept maps were effective only for the initial low critical thinkers. In contrast, case studies combined with concept maps was effective not only for low critical thinkers but also for high critical thinkers. Possible mechanisms involved in case studies with concept maps were discussed. When students were given a case for discussion, high critical thinkers might present some ideas related to the case. However, such ideas might be at a relatively ordinary level in the CS groups without concept maps. Such ordinary ideas might be effective to improve critical thinking skills in the low critical thinkers but not in the high critical thinkers. By contrast, if the case studies were combined with concept maps, high critical thinkers might be activated to provide clear reasoning and thus innovative ideas. To improve critical thinking skills in both the high critical thinkers as well as the low critical thinkers, clear reasoning and innovative ideas supported by case studies combined with concept maps is an effective approach.

The present study provides the first clear evidence of effectiveness of case studies and concept maps to improve critical thinking skills in Indonesian college students. However, further examination is needed on several points. First, effectiveness of case studies and concept maps on learning of class contents was not assessed in the present study. Second, the mechanism how concept maps improved critical thinking skills remains speculative. The hypothesis about the

mechanism of case studies and concept maps is testable by recording and analyzing levels of case study discussions with or without concept maps to assess if indeed concept maps lead to deeper discussions in case studies. Further studies are needed to clarify these points.

CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem

Recent years the progress and application of students' critical thinking has been one of the focus in societies, job setting and educational studies (Boddy, Watson, & Aubusson, 2003; Gellin, 2003; Larsson, 2007). Educational setting start to include critical thinking as one of the essential abilities that need improve through learning process. For example, critical thinking choose as one of the 10 learning goals for psychology majors by The American Psychological Association (2007).

Critical thinking also plays an important role in human's different life aspects (Abed, Davoudi, & Hoseinzadeh, 2015) including social and interpersonal contexts that lead a person to make decision and problem-solving on a daily basis (Ku, 2009). On a daily basis, we are confronted by science-based claims and counter-claims which encourage the audience to think and shape their opinion based on what they hear or see, from relatively simple things like when choosing house materials, up to more complex things like talking about climate change. Some people are credulous, they quite easy to persuade without evaluating the information they find first. Research found most youth to be largely uncritical on inappropriate criteria when seeking information online (Metzger, Flanagin, Markov, Grossman & Bulger2015). For example, in a study of children's information-seeking behaviors, Shenton and Dixon (2003) asked participants to describe instances where they sought information for school or personal use, despite sometimes expressing dissatisfaction with what they felt to be questionable information, no attempts were reported to check the credibility of any information retrieved from electronic sources from all participants in this research.

Researchers have analyzed the main factors that influence decision making, using data from 91 studies involving nearly 8,000 participants regarding information preferences in relation to attitudes, beliefs, and behaviors in situations that provided choices between congenial information, which supported participants' pre-existing attitudes, beliefs, or behaviors, and uncongenial information, which challenged these tendencies (Dolores, Hurt, Brechan & Merril, 2009). The examinations asked participants about their perspectives on a given subject and afterward enabled them to pick whether they needed to view or read data supporting their own particular or a contradicting perspective. The result was that individuals are about twice as liable to choose data that support their own perspective (67 percent) as to consider an opposing idea (33 percent). People with close-minded personalities are more unwilling to open themselves to differing perspectives. This research also found that people are more resistant to new concepts and points of view when their own ideas are associated with political, religious or ethical values. The conclusion of this study was that people have a tendency to ignore new information, if the new information does not match with what they believe or with prior knowledge, which might lead to faulty thinking. We need to be able to separate substance from what we believe and what is true information, to identify misrepresentations and assess levels of uncertainty and trustworthiness before we decided to believe or agree with an idea or information. Therefore cultivating critical thinking skills is needed, to avoid incorrect arguments or decisions by analyzing the situation and the presented data.

Indonesia consists of a pluralistic society with different tribes, religions, and language. This diversity enriches Indonesian culture, however this diversity is also used by irresponsible parties to break down the unity to achieve certain goals. As example, in 2019 Indonesia will hold elections to elect representatives as well as the presidents. Following this event, it also reported that there is increasing number of rumors like false news and hate speech that spread

in media especially in social media. A report on CNN Indonesia presented data by the Ministry of Communications and Informatics mentioning there are as many as 800,000 sites in Indonesia that are potential generators of false news and hate speech (Pratama, 2016), this indicates that many untrue reports are spread by people who are irresponsible, where its impact on people who are not accustomed to analyzing the correctness of the news will be easily distracted and may feel compelled to do things that are harmful to others even can be threaten the integrity of the state

Information transmitted through social and electronic media is easy to share and read by many people, therefore it might have a large effect on the emotions, feelings, thoughts, and actions of a person or group. Psychologically, if fake news is believed by the recipient, it indirectly also affects the way we think, one of the consequences may be the onset of anxiety, hatred, and even fear for the reader. There are some reaction that people usually shown when they received particular news; first people are more likely to believe if the new information matches their opinions or attitudes, without searching the truth. For example, if a person who believes that the earth is flat gets an article that discusses various conspiracy theories about satellite images then instinctively the person will tend to believe these stories because it supports the flat earth theory that they believe. Naturally positive feelings will arise in a person if their opinions or beliefs are affirmed and tend not to care whether the information they receive is true and even it is easy for them to redistribute the information as mentioned in Dolores, Hurt, Brechan,& Merril (2009). This can be worsened if the receiver of information has inadequate knowledge in using the internet to seek more information or simply to check and review facts and has no way to evaluate the veracity and truthfulness of internet sites.

Second, because of the tendency that we are more likely to feel positively towards people who share the same or similar identity (in-group), then when there is news that is not necessarily true about injustice event caused by an outgroup, spread by people who have

attributes similar to us, this can cause feelings of hatred against the outgroup and may end up inciting conflict. The concept was driven by the observation that human social arrangements are universally characterized by differentiation into in-groups and out-groups where the feeling of us-them distinctions create boundaries of loyalty and cooperation among individuals (Brewer, 1997). Attitudes and values are shaped by this in-group vs out-group distinction in that individuals view all others from the perspective of the in-group. The tendency for feeling in-groups sometimes harmless, in this case people might prefer to socialize with people who share value like race or ethnicity and might categorizing towards outgroup that may lead to prejudice and discrimination.

Third, with people whom tendency to not care about the content of the information that they received, however they shared the information without further analysis. This reaction also have negative side effect, because if the information is false means more people might misguided. Last reaction is people who do some research for found supporting data to ascertain the truth of the news. However, this last reaction might not the favorite's one, due this act are time consuming, demand ability to think deeply into an information, collecting data and then analyze it to determine the truth. Therefore, mostly people tendency to receive information without trying to find the truth, which lead to false belief and might cause suspicion on certain parties or others group.

Prior research and studies report that people who are more educated and taking courses that are related to stereotypes and prejudice express fewer stereotypes and prejudice in general (Rudman, Ashmore & Gary, 2001, Sidanius, Van Laar, Levin, & Sinclair, 2006). Research also shows that teaching critical thinking is a tool for removing prejudices and stereotypes of individuals through multicultural education which has been taught for several years (Martincova & Lukesova, 2014). By improving critical thinking when tasked with evaluating news then the students will apply critical roles as interpreter, analyst, and evaluator. The

interpreter role functions to get to know the media and data; the analyst applies concepts, such as source verification, fact-checking; the evaluator tries hard at producing his/her own content, sees the consequences of his/her choices and makes decisions about distribution so that they can avoid the traps of fake news. Critical thinking is also defined by The American Philosophical Association (1990) as "purposeful, self-regulatory judgment that uses cognitive tools such as interpretation, analysis, evaluation, inference, and explanation of the evidential, conceptual, methodological, logical criteria, or contextual considerations upon which judgment is based. By improving our citizen's critical thinking skills through education, we also make a significant contribution to avoiding the occurrence of misperception and conflict.

The other major problem is that many university graduate's competences doesn't match the competence and qualification needed by the current job market (Moeliodihardjo, 2010). The problems that students encounter in the classroom sometimes not similar what they face in their working life, where problems encountered are more varied, and influenced by many factors, are unstructured and have conflicting objectives (Yadav, Lundeberg & DeSchryver, 2010). Results from a survey of employers carried out by the World Bank in 2008, showed that two-thirds of employers complained that finding employees for professional and managerial positions that need higher skills and critical thinking was very difficult (Gropello, Kruse & Tandon, 2011). A certain degree of difficulty in finding qualified workers with critical thinking might be a sign that the education sector is not providing students with the appropriate skills. To overcome this problem requires major investments, higher education needs to provide the opportunity to students to become involved in learning activities that have meaningful and relevant learning outcomes. Student needs to reach the highest level in his/her thinking ability for competing in their work field in the future.

However, many types of research show that most educational systems did not really focus on reaching this goal. For example, the Turkish education system aims to improve

critical thinking skills, the reality showed the method of learning that has been applied for the most part was a ‘‘read and repeat’’ model conducted in the learning process (Sahin, 2014), where this type of learning process is reducing the potential for students to improve their thinking skills and to explore their true ability. These findings indicate that even there is growing attention of the need effective instruction for critical thinking but the reality has not been implemented optimally. In a similar, a study conducted by Bouton (2008) found that most educators only understand critical thinking skills based on their own personal experience rather than based on a scientific theory. In addition, educators also indicated that they had no formal training in developing a method of learning that can encourage critical thinking skills and dispositions. Therefore, educator's knowledge and skill about critical thinking might not meet the objectives to be achieved in the classroom. The other problem is on how teacher transfer the complexity of critical thinking to student. Communicate effectively about critical thinking can be challenging effort for teacher.

The application of critical thinking in the education system has some serious issue to accomplish this purpose. Research shows that even in general higher education is not successfully teaching critical thinking at the third stage, third level, and postsecondary education (Stedman & Adams, 2012; Willingham, 2008). An investigative research by The California Commission on Teacher Credentialing found that regardless of the large number of educational workers who indicated that critical thinking is an important goal of education, however only a small percentage (9%) that teach critical thinking in learning activity (Paul, Elder, & Bartell, 1997). Ironically, as it turns out, the approach in teaching subject matter to our students sometimes only focuses on how we deliver information to the student and we tend to forget the main things in the learning process for the graduate level is to create talented youth to compete in the global market and to prepare them to participate professionally in real work life.

There are difference opinion between educational practitioners and academic, as example while educators frequently talk about critical thinking as an objective, researchers have largely avoided the term, preferring constructs that can be more precisely defined and measured. (Kuhn & Dean, 2004). Another issue about critical thinking is the unclear formula about which educational techniques are useful for improving it (Brunt, 2013, Heijltjes, van Gog, Leppink, & Paas, 2015) Some studies mentioned that learners' critical thinking skills are quite difficult to develop naturally as an outcome of higher education (Davies, 2013; Elander, Harrington, Norton & Robinson, 2013). Due some reason, students do not seem to improve their critical thinking through their studies during university (Arum & Roksa, 2011). However, there is also some prove found beyond its complexity, critical thinking skills can be taught and learned in through learning activity (Abrami, Bernard, Borokhovski, Wade, Surkes, Tamim, & Zhang, 2008). Through a supportive learning atmosphere were students simultaneously occupied with the atmosphere of problem solving teaching conditions and student adapting some strategies and solutions on how to maintain solutions to situations, therefore student develop critical as well the ability to interpret and analyze. Educational institutions must admit the essential need to develop thinking skills in students, moreover giving clear instruction about critical thinking help students to transfer those skills taught in the classroom to their lives and even after student graduate from school.

In Asia, despite the considerable differences between each countries, the governments have recognized the necessity of ushering in changes in teaching and learning practices in schools (UNESCO, 2015). In view of the need to improve the quality of education for all. In details, there is develop awareness of the global shift taking place in approaches to teaching and learning, moving from the conventional, teacher-centered transmission approach towards a learner-centered (UNESCO, 2015), which de-emphasizes practice in managing problematic situations. The predominant situation in the Indonesia education system. Indonesia is a nation

of islands with around 13,446 islands (Geospatial Information Agency of Indonesia, 2017), including the islands of Java, Sumatra, Kalimantan, Sulawesi, Lesser Sunda Islands, and Papua (or Irian Jaya). Indonesia has a population of 266 million (World Population review, 2018) encompassing major linguistic, religious, tribal, and cultural differences. As a developing country education plays an important role (Johan & Harlan, 2014) to empowering the human resources. However, considering there are more than 55 million students in all level of education (The Economist, 2014) spread across 33 provinces with different backgrounds, promoting a better quality of education is challenging.

Between different perspectives over what a quality education means and how it is accomplished, the larger part of schools in the nation keep on exhibiting a strikingly steady example of classroom activity that dominated by rows of desks, whole-class grouping systems and chalk and talk or traditional method learning. Traditional methods of learning use many facts and not enough conceptualization; an excessive amount of memorizing and not enough thinking on your own. This is also supported by some research (Daz-Iefebvre, 2004; Hay, 2018; Kang & Howren, 2004) that show that lectures and memorization do not help develop long-term knowledge or the thinking ability to adapt knowledge to new situations. Therefore, lectures and rote memorization do not promote critical thinking. Using Bloom's (1956) cognitive taxonomy to determine critical thinking skills, the traditional lecture approach result students to engage in activities and teachers where there is less effort and plan to ensure that meaningful learning develop. Therefore, the three highest levels of Bloom Taxonomy operation which are analysis, synthesis, and evaluation that involve the ability to think critically are not accomplished. Building connection between critical thinking skills with content of the learning process, required teacher to focus on the process that employs students' higher-order thinking skills (Duplass & Ziedler, 2002; Wong, 2007).

To help students become critical thinkers, then we need to encourage and develop it from an early age. Ignatavicius (2001) mentioned the following characteristics for critical thinkers: "outcome driven, open to new ideas, flexible, willing to change, innovative, creative, analytical, communicators, assertive, persistent, caring, energetic, risk takers, knowledgeable, resourceful, observant, intuitive, and 'out of the box' thinkers" which is it will be difficult to nurture with the teacher-centered based learning concept. Pursuit of this goal is not easy and usually needs a long time, especially if the students are familiar with learning patterns that put them as a recipient of information rather than as a searcher and information analyzer. Some methods reported have positive contribute on critical thinking, such as; musical skills have sophisticated multiple effects on individuals, music can play an important role in intelligence and thinking abilities (Topoğlu, 2014), blended socratic method of teaching (BSMT) is comprehensive model combining the Socratic method of teaching, information and communication technology (ICT), and business case helps improving the critical thinking skills of the business students (Boa, Wattanatorn & Tagong, 2018) paintings are relevant for improving the comprehension of concepts related to cognitive understanding of systems thinking, i.e. enriching the whole person, reinforcing critical and creative thinking skills. (Molderez & Ceulemans, 2018)

Some research mentioned linking critical thinking skills to the content of the learning process, the instructional focus should be on the process of learning that employs students' higher-order thinking skills (Duplass & Ziedler, 2002; Wong, 2007), which means that students should actively engaging in the learning task/activity. One of the most popular method that can encourage students to engage with the material, participate in the class, and collaborate with each other is active learning. Active learning is a learning method to accustom students independently by themselves. When students learn actively, it means that students dominate the learning activities. In addition, students actively use their brain, either to find the main idea,

from lectures, solving problems, or apply what they have learned to the problems that exist in real life.

The effort to improve Indonesian education quality has focussed on introduction of an active learning approach on teaching and learning process. According to Sopantini (2014) since 1998, which marks the changing of government from the New Order to the current reform period, the focus has shifted to a structural change in policy. However, Sopantini (2014) found that implementation of the policy of active learning has essentially failed due to a combination of technical, political and cultural factors and the interaction between these three factors. Furthermore, Sopantini (2014) found most teachers in North Maluku, Indonesia showed a low capacity within the system to implement the active learning method in class and a lack of understanding regarding the theory and practice of active learning, furthermore there is a very limited number of capable facilitators that are able to evaluate teacher performance using active learning. Thus, due to the lack of knowledge about how to utilize the active learning method, many teachers still use the authoritarian method for teaching and delivering subjects and still heavily relies on memorizing texts.

Meanwhile, critical thinking skills can be improved in classroom activities when students are required to actively solve problems (Nelson & Crow, 2014; Youngblood & Beitz 2001). Bean (2011) discovers that active-learning practice as one of firm strategies that create students became powerful thinkers and better arguers. For example, when students are assigned to define or clarify an issue, students will assess which information is relevant and irrelevant, seek additional information as needed and formulate the right questions. Previous research found that various active learning methods effective on improving critical thinking skills and dispostions, such as flipped classroom (Dehghanzadeh & Jafaraghaee, 2018), direct infusion (Bensley & Spero, 2014) mobile learning (Cavus &Uzunboylu, 2009), project-based learning (Sasson, Yehuda & Malkinson, 2018) and scrabble board game (Kobzeva, 2015).

As one of the main purpose of education is to prepare student to compete and perform in working life, therefore education need to reform the teaching strategies that focus on helping student's ability to be creative, innovative and think critically, not simply to memorize. Students might just know basic information and not common on solving a problem, therefore they struggle in working life and daily life that demand them to make decision and be critical thinker. Hence, we need to implies the learning method that help student to bridge the relation between theoretical and practice, thus when faced with real conditions student can solve the problem with the experience and lesson that they received during study. Furthemore, by encouraging students to analyze, synthesize and evaluate when students are required to solve the problem, educators will also help students become good thinkers (McCown, Hammer, Hargreaves, Holzworth, & Freebairn, 1996).

One of the strategies that effective to bridge the gap between theory and practice is case studies. A case studies approach facilitates synthesis of content knowledge and the application to solve a narrative story, which also enable to student ability to identified goals to be reached (DeSanto-Madeya, 2007). The case studies method involve an educational strategy whose aim is to engage students by reflecting on the situations presented in the case under investigation, to analyze realistic data with regard to it and to become involved in making decisions (Prince & Felder, 2006) that facilitate the development of the higher levels of thinking process.

The case studies is one of the popular teaching strategy in the western education system. Some research has demonstrated the effectiveness of case studies in promoting active learning and helping students to understand complex and complicated issues (Kunselman and Johnson, 2004), in facilitating students to remember details and facts (Beyea, 2004) and in improving educational outcomes (Sanders-Smith, Bonahue, & Soutullo, 2016). Meanwhile, several study support the application of case studies as a one of the strategy to improve the development of critical thinking skills and critical thinking disposition. (Huang, Hsia, & Ling, 2012; Jonassen

& Serrano, 2002). Whilst in Indonesia, even though the use of case studies is a method that is commonly known, there is little evidence of its use, or empirical research demonstrating its use to promote critical thinking. There have been some studies from Indonesia that showed the effectiveness of case studies for improving learning outcomes (Utami and Indriyanti, 2014), increasing student enthusiasm and promoting a democratic atmosphere in the class (Anggraeni, 2012).

Another strategy is a concept map in which help students to visualize relationships among concepts by diagramming major concepts and associated data in a format that is logical to the learner and relevant to the subject matter. Concept maps may help bridge the gap between theory and application as Wheeler and Collins (2003) found that the use of concept maps to link knowledge and practice was an effective means of improving critical thinking skills. This study intend to improve the knowledge of how students develop critical thinking skills by assessing a case studies with concept maps and a case studies with a preparatory training model for improving students' critical thinking abilities in the introduction to psychology courses. In learning from a case, the students determine the relevant facts, analyze and create conclusions about the problem and what action to take. Students encounter the problem before they create the structure to solve it. We assume that if we help a student in the process use concept maps, then the result might significantly improving critical thinking. Using concept maps helps to visually examine what students have learned, and through this process students might examine their previous knowledge (Lee, Chiang, Lioa, Chen & Liang, 2013) and combine that with new information, formulate it in a more critical and adjusted way to solve or describe a case. By create educational environment that provides opportunities for student to actively use their ability, engage in learning process, choose their preference activity then discover a meaningful idea will help to improve critical thinking.

Several study have shown support for the application of case studies combined with concept maps as a teaching strategy to promote the development of critical thinking skills and a critical thinking disposition (Huang et al., 2012; Jonassen & Serrano, 2002). In the research of Huang et al., (2012), a case studies was given as group assignment, nurses were required to work cooperative to solve a case that related to the subject matter. We intended to replicate the findings of Huang et al., (2012) regarding the educational setting for Indonesian college students. As mentioned before, there are some studies in Indonesia about the case studies, yet very few studies that combine case studies with concept maps to evaluate the effect on critical thinking.

In this study, we conduct two experiments at two different times, in which Experiment 2 is an advanced study to clarify the results of Experiment 1. For Experiment 1, the aim is to examine the effect of a case studies in combination with concept maps on critical thinking skills and critical thinking disposition. In Experiment 1, students were assigned one of the following three groups: a case studies with concept maps, a case studies alone and a traditional lecture without any active learning methods. According to Huang et al. (2012), it was expected that improvement of critical thinking skills and disposition would be greater in the case studies combined with conceptual mapping than in the case studies alone. In Huang et al., (2012) research, the case studies combined with concept maps and case studies alone were developed as experimental group without any control group, where students were required to work in group to solve a case that related to the subject matter. Meanwhile in our study for Experiment 1 as well for Experiment 2, we use control group to provide a comparison of baseline for determining the extent of change after the experiment is performed.

The purpose of Experiment 2 was to examine whether preparatory training for a case studies activity has an effect on improving critical thinking skills compare with the others three group that we use in Experiment 1. Studies have shown that case studies alone without a

concept map is an effective and beneficial learning strategy (e.g., Bayona & Castaneda, 2017; Kreber, 2001). Grant (1997) outlines the advantages of using case studies as an interactive learning strategy, shifting the emphasis to more student-centered activities rather than teacher-centered. Popil (2011) argues that by applying preparatory training of a case studies activity, might help the student to increase their knowledge and experience in solving a case also and ability to link theory to practice therefore it will activate student higher thinking. In this case, our thinking was to give students some training using a case studies activity to investigate the effect of preparatory training on critical thinking. Theoretical and empirical studies have explored the advantage and disadvantages of instruction compared to other methods of learning such as case studies and the traditional method of learning (Ertmer, Newby, & McDougall, 1996; Yadav, Vinh, Shaver, Meckl & Firebaugh, 2014). Therefore for Experiment 2 the purpose is to clarify the effect of preparatory traing on improving critical thinking skill and disposition.

1.2 Purpose of the Study

The first purpose of the study was to empirically assess the effectiveness of case studies with concept maps for improving student to think critically and critical thinking dispositions. Second, was to explore the effectiveness of preparatory training on improving skills and dispositions to think critically. The model (treatment) was used to teach the first year students in analyzing a case that related to Introduction to Psychology subject. The purpose is to help students to develop skills needed to think critically through solving the case, for example by using a case to solve a problem, student have a chance to collecting reliable data, interpreting information from different sources and contending the evidence.

1.3 Research Questions

Based on the statement of the problem, this study attempt to answer the following questions.

For Experiment 1:

1. Will a group of students presented with a case studies combined with concept maps who receive explicit training using the FreeMind application demonstrate better on the Cornell Critical Thinking Level Z compared with the case studies and Control Group?
2. Will a group of students presented with a case studies with concept maps who receive explicit training in using the FreeMind application model score better on the University of Florida Engagement, Maturity and Innovativeness (UF-EMI) test compared with the case studies and Control Group?
3. Will a group of case studies students who receive a case to solve present better on a test that requires them to analyze the Cornell Critical Thinking Level Z?
4. Will a case studies group on the University of Florida Engagement, Maturity and Innovativeness (UF-EMI) score higher compared to the Control Group?

For Experiment 2:

5. Will a group of students presented with a case studies with concept maps who receive training in using the FreeMind application model show better score on the Cornell Critical Thinking Level Z compared with others group?
6. Will a group of student who receives preparatory training of case studies perform better on the Cornell Critical Thinking Level Z compared with the case studies and Control Group?
7. Will a group of students who receives preparatory training of a case studies for critical thinking score differ in Engagement, Maturity and Innovativeness (UF-

EMI) compares than case studies and Control Group?

8. Will a group of students presented with a case studies in combination with concept maps perform better engagement and perform in learning activity compares to others group on Student Activity Observation Sheet?

Summary

This chapter provide an intuitive description of research problem and purpose of this study. The section described the reason on choosing the model a case studies with concept maps and preparatory training to improving critical thinking. Eight research questions were stated showing goals to test the viability of the model observationally utilizing instrument that assessed students' ability on analysis of induction and deduction reasoning, observation and credibility, making assumptions and meaning also dispositions toward critical thinking. Supplementary, this section explain the meanings of essential terms utilized in this examination, and distinguished the purpose for each Experiment.

CHAPTER 2

LITERATURE REVIEW

This chapter embraced several important areas of literature review, citations and explore reports reviewed in this archive put the investigation into a coordinated viewpoint. This part is separated into the accompanying segments: (1) critical thinking that explore about (a) definitions of critical thinking skills and disposition, the characteristics and other commonly issued that related; (b) critical thinking dimensions, (2) case studies describe (a) definition of case studies strategies; (b) case studies with concept maps; (c) case studies with preparatory training, (3) methods to apply teaching critical thinking to Indonesian college students. These filed of investigation shape the reason for the instructional treatment portrayed in Chapter two.

2.1 Critical Thinking

2.1.1 Definitions of Critical Thinking

We often heard news or issued that occurs in media or daily life, the next questions across are we should believe everything that we heard or read. Unfortunately, most people do that; consciously or not. We sometimes feel it would be easier to believe what said by others rather than having efforts to find appropriate information. This is one reason that causes us to fail to become critical thinkers. Most people have a tendency to follow public opinion, although sometimes that opinion is not necessarily correct or the application inappropriate. The inclination is due to some reasons such as fear will differ with others or lazy to collect accurate data about a particular topic.

The term critical thinking is widely used in the fields of education, psychology, and philosophy, and recently, there have been using also in medical field research. Critical thinking is conceptualized as an operative example of higher order thinking that defined as a skill of

taking responsibility and control of one's own mind (Paul, 1996), these processes include skills such things as classifying, inferring, observing, evaluating, synthesizing, and hypothesizing. Some basic complexities approaches among the diverse proffered records of critical thinking prevalent in educational theory and practice, which categorized on descriptive and normative. Schunk (2008) define descriptive originations as a tendency to confine in terms of cognitive skills, and focus on the mental processes involved in thinking, while cognitive approach focus on the significance of mental procedures in learning process which occurs on supportive environment involving perceptions, thoughts, beliefs, attitudes, and values student in developing, acquisitions, forgetting and recovery information. A thought is difficult to be affected unless the support data is given consistently and rationally, through the critical thinking process, the individual will also evaluate whether the results of his thinking process has been able to solve existing problems. Therefore, critical thinking is often described as a metacognitive process which means the ability to use prior knowledge to plan a strategy that consisting of a number of sub-skills which if we used appropriately, increases the chances of producing a logical conclusion to an argument or solution to solve a problem (Dwyer, Hogan & Stewart, 2014). Critical thinking also defined as reflective thinking which refers to critical thinkers must capable of reflecting the reasonable of their own and other's thought. Focused thinking refers the thinking process is consciously directed and intently. The others elements focus on a decision about what to believe or do which indicates that critical thinking assesses statements (what we believe) and actions (what we do), then deciding what statements or actions more reliable.

From a psychological point of view, critical thinking tends to be linked with creating sharp decision making, create an opinion based on analysis of reasons, to overcome individualistic thinking, and to represent logical thinking flow to reach conclusions regarding what should be done, based on research evidence (Bassham, Irwin, Nardone & Wallace 2011).

Thinking alone is an activity of someone in search of a proper answer, filtering out various kinds of unimportant and distracting data or information, solving problems, to decide something (Colley, Bilics, & Lerch, 2012). Critical thinking as a process of identifying a range of possible courses of action, recognizing uncertainties about which course of action is best, and seeking relevant information to help make a decision (Wolcott, 2006). Previous researcher definition of critical thinking create main contributions to the development of critical thinking elements that consisted of a dispositional and skill dimension. Engaging problems and making decisions using critical thinking involves both skills and disposition immersed in increasingly complex and differentiated environments. Choosing between collected data and sources is required higher-order skill, especially to judge the credibility and validity of the sources. Therefore, these critical thinking is not a common skill possessed by individuals. An individual with strong critical thinking skills would recognize that many possible courses of action exist for this problem (Wolcott, 2006)

There has been a comprehensive debate on what critical thinking really is (Johnson & Hamby, 2015; Tsui, 2002). One area of discussion has concerned what to incorporate and prohibit in the definition of critical thinking, whether critical thinking just a set of skills or does it also include dispositional aspects as well? Some assumption said that the critical thinking skills are a natural talent possessed by some individuals. In the early 1985s, specialists working in the critical thinking field noticed that the capacity to think critically is different from the disposition to do so (Ennis, 1985). Experimental confirmation seems to affirm the thought that critical thinking abilities and dispositions are, in fact, isolate elements (Facione, 2000). Most psychological based scholars have liked to utilize "thinking aptitudes" (or higher request thinking abilities) as opposed to critical thinking as a generic term (Lewis and Smith, 1993; Sternberg, 1987).

Mogensen (1997) suggests that critical thinking is the ability to think is reflective and evaluative directing the reasoned judgment. Mogensen added that critical thinking is a concept that covers the entire view in epistemology, transformative, dialectical and holistic. Perspective epistemology emphasis on how individuals actively test and ask the things that are around. The second perspective is a transformative emphasis on how individuals change various aspects of his life such as lifestyle, behavior and value the better. A dialectical view of the emphasis on how individuals view problems using a variety of viewpoints, listen to opinions of other people and treat other people fairly and responsibly. The fourth perspective is to think holistically, meaning that critical thinking involves both cognitive and affective aspects are interrelated. Critical thinking can also be called with the thinking that has a direction because it focuses on the expected result. Critical thinking leads to a way of thinking individuals who require support to a trust. This definition of critical thinking is not simply accepting or rejecting a statement but includes a set of abilities and dispositions that help in deciding what to believe or do when employed.

Critical thinking skills are considered to be basic for the advancement of metacognitive comprehension that involve higher order thinking displayed by attitude toward a given learning task. Critical thinker will actively collecting data, monitoring comprehension, and evaluating progress before decided the truth of an information. Therefore, critical thinking is an individual effort to seeking the true information, and analyze all related data to find the answer to the problem. This whole process will lead to some action that the individual decided through a supportive teaching and learning process that requires critical thinking skills in selecting all the possibilities that exist and accompanied by supporting factual data. In this research, we emphasize critical thinking is reasonable reflective thinking that focused on deciding what to believe or do by evaluative directing the reasoned judgment includes a set of abilities and dispositions that help in deciding.

2.1.2 Critical Thinking Dimensions

Critical thinking is essential tool for investigation and solving problem, furthermore critical thinking is a great asset in one's personal and civic life. Therefore, teaching critical thinking implies progressing in the direction to build a citizen that has ability on solving problem. The dimensions of critical thinking also developed by the American Philosophical Association Delphi identifies six cognitive abilities is a key concept of critical thinking (Facione, 1990), which involving both cognitive and affective domains. The dimensions of cognitive are interpretation, analysis, evaluation, inference, explanation, and self-regulation. Meanwhile for the dispositions are discussed extensively in this report below. Along these lines the Delphi experts could achieve agreement on a comprehensively comprehensive meaning of basic reasoning that combined both cognitive skills and affective dispositions, however the experts remained profoundly divided on the issues that Paul has demanded in his examination regardless of whether or not critical thinking includes a normative dimension. The sixth aspect is further defined by the following explanation:

a. Interpretation, which refers to understand and express meaning or experience, situation, data, assessment, rules, beliefs, customs, procedures, and criteria. Through this interpretation, individuals are encouraged to be able to recognize a problem and reading the nonverbal movement of another individual to be able to understand the meaning given another individual. Interpretation contains with categorization, decoding, significance, and clarification of meaning.
b. Analysis implies ability to distinguish the reason and connection between proclamations, questions, ideas, depiction or different structures that represent intended to express certainty, judgment, reason, data, and feelings. The analysis consists of

several sub-specialties which are expertise to test ideas, detecting arguments, and analyzing the existing arguments.

c. Evaluation intends to quantify the credibility of proclamations or different portrayals which are estimated from individual experience, situation, judgment, belief or opinion, perception and to measure the strength of the relationship between. The evaluation consists of skills, which is the ability to measure the demands and arguments.

d. Conclusions. Conclusions are intended to identify and ensure that each element can draw conclusions reasoned, to establish estimates and hypotheses, to consider the relevant information and to show the consequences derived from the data, statements, principles, facts, judgments, beliefs, opinions, concepts, description, questions and other forms of representation. Conclusion consists of several sub-skills, which are questioning the fact, estimates the choices and describe alternative conclusions.

e. Explanation. The explanation refers to explain the results of an argument, to justify a reason in terms of facts, concepts, methods, criteria, and consideration of circumstances involved in determining the results; and to represent a form of reason in the form of a convincing argument ". Explanation consists of several skills such as explaining the results, determine the procedure and represents an argument.

f. Self-regulation, which is "the consciousness of individuals to monitor their own cognitive activities. At this stage the individual monitor cognitive activity itself by questioning, validating and correcting the form of a statement. On this aspect, there are two important things to do which are testing and corrections made by yourself.

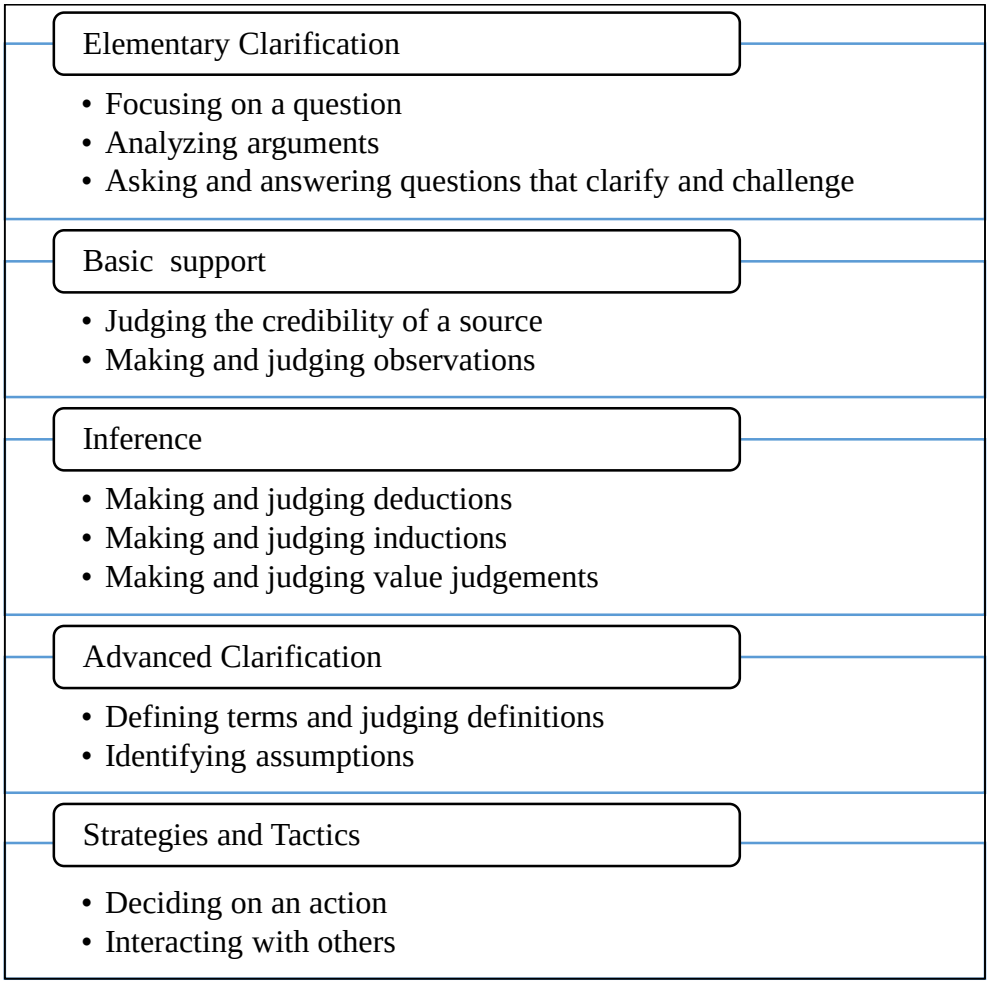
Another studies by Ennis, Millman & Tomko, (2005) mentioned the critical thinking including areas of induction, deduction, evaluation, observation, credibility of statements, assumption identification, and meaning. The key element for developing critical thinking ability is repeatedly practice in making decisions and conclusion based on data, then continue

formulate feedback on those decisions. Even an expert might fail to appear critical thinking ability, on the other hand sometimes we can find children who impressively demonstrate critical thinking skills. Children are interested in many things, children spend a lot of time with developing critical questions, and somehow many of this questions are difficult to answer by an adult. However, with the increasing age, how the adult reacts towards their questions and some other factors, children slowly begin to diminish their critical thinking skills and of course it is affected the critical thinking ability. The other factors is the incompatibility of learning approaches with cognitive characteristics at a certain age. Using Piaget's cognitive development theory adaptation Başkale & Bahar (2011) examine the child's characteristics and learning patterns in the preoperational stage to develop nutrition education for preschool children found knowledge scores increased and the group's food preferences positively changed. This study emphasizes the important of a child-centered approach, self-discovery, guidance to children and activity-based teaching to build positive behavior on children.

Some thinking such as our race, religion, ethnic group, social class, political party, or philosophy of life are important to us (Ruggiero, 2009). As people grow up, they tend to be more sensitive related to their personal identity and thought. People will feel attacked their self-esteem when we express the opinion that seems to underestimate their ability or blame his thoughts and knowledge. "Mine is better" thinking is natural and often harmless. Since critical thinking related to problem-solving context, and involved with other people, the person needs to apply certain tactics and strategies for keeping the problem-solving process on task, communicating coherently with others, collecting observation support for a decision about what belief or action then judge the soundness of the information (Norris & Ennis, 1989). In line, a critical thinker must be able to make good inferences, then carrying out the critical thinking in orderly and deliver it with an effective way to others, therefore other people don't

feel they are offended by judgmental opinion. The table below describes the critical thinking skills outline developed by Norris & Ennis (1989).

Table 2.1 Topics for Evaluating Critical Thinking Abilities by Norris & Ennis (1989)



The dimensions of critical thinking developed (Facione, Giancar & Facione,1995). Facione suggests seven dimensions of critical thinking which are the curiosity, open-minded, systematic, analysis, truth-seeking, confidence in critical thinking and maturity. Seven dimensions are then compiled into The California Critical Thinking Disposition Inventory (CCTDI). The seventh dimension is further described as follows:

a. Inquisitive, this dimension measures the intellectual abilities of students in searching for information and the desire to learn in spite of the knowledge that is needed even though the lesson has not been taught before.
b. Open-minded measures the extent to which individuals can tolerate different thoughts and sensitivity against the bias that may be carried by the individuals themselves.
c. Systematic refers to measures the tendency of individuals to organize, compose, focus and keep on digging for the information even at the high level of complexity of information.
d. Analytical, this dimension emphasis on how individuals use reasons and facts to solve problems, anticipate possible problems that may arise and consistent will need that at any time required another intervention in resolving a problem.
e. Truth-seeking, in this dimension, focuses on how individuals continue to try to seek knowledge required in accordance with the context, have the urge to keep asking and honest and objective in looking information even if the results do not support the opinion that these individuals possess.
f. Confidence in reasoning aims to measure of individual confidence when the process of conveying the reasons a problem. Confidence in critical thinking provides an opportunity for individuals to be able to trust the reasons given by the individual judgments and to lead to a rational problem-solving
g. Judicious in this dimension measures the tendency of individuals to assess the nature of the decision. Judicious in critical thinking can be characterized on how an individual approaches the problem, gather information and make decisions despite the difficult situation, believes that some situations may require more than one possible choice of settlement and in assessment must comply with the standard, context, and facts associated with problems.

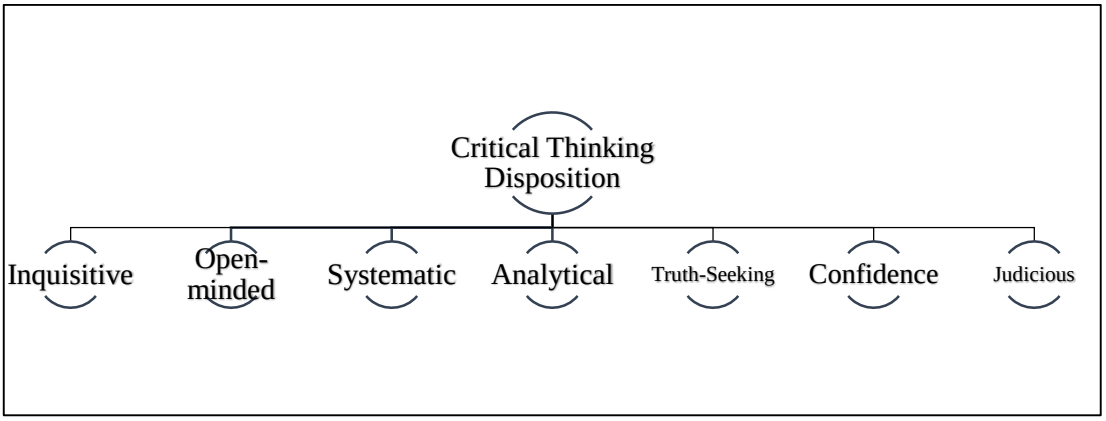


Figure 2.1 Critical Thinking Dimensions by Facione (1995)

However, among the several dimensions associated with critical thinking skills above, it is interesting to include judicious as one important dimension to the critical thinking skills. People who have good critical thinking skills, also need to have judicious in thinking. Occasionally, there are things that difficult to convey directly to others, in this case, words without filtering might cause others false interpret what we mean, so we need to have to use words that are subtler and discreet, therefore people can understand the intent we truthfully. It is very necessary, being critical thinker doesn't mean that we reserve the right to hurt the feelings of others through our opinion, but critical thinking demand ability to analyze a variety of circumstances with systematic, then choose the best option and deliver precisely that opinion on others. Norris & Ennis (1989) define critical thinking dispositions as the critical spirit which motivates critical thinkers to apply critical thinking abilities to their own thinking and to others and create standards of critical thought. Broadly speaking, having critical spirit lead a person with a certain type of character, which one of the most important element is open-mindedness. The table below gives a brief list of critical thinking dispositions covered by evaluating clarity-related abilities, basic support-related abilities, inference-related abilities, and strategies and tactics in critical thinking in an orderly and effective way.

Table 2.2 Topics for Evaluating Critical Thinking Dispositions Critical Thinkers

By Norris & Ennis (1989)

1. Seek a statement of the thesis or questions;
2. Seek reasons;
3. Try to be well informed;
4. Use credible sources and mention them;
5. Take into account the total situation;
6. Keep their thinking relevant to the main point;
7. Keep in mind the original or most basic concern;
8. Look for alternatives;
9. Are open minded and
    a. seriously consider points of view other than their own;
    b. reason from starting points with which they disagree without letting the disagreement interfere with their reasoning;
    c. withhold judgement when the evidence and reasons are insufficient
10. Take a position and change a position when the evidence and reasons are sufficient to do so;
11. Seek as mush precision as the subjects permits;
12. Deal in orderly manner with the parts of complex whole;
13. Employ their critical thinking abilities
14. Are sensitive to the feelings, level of knowledge, and degree of sophistication of others

As mentioned before, we deal with many conditions that offer us to think critically about the situation. However, the question is what situation or problem that showed someone shown an ability to think critically? It needs to be clarified that every day we will face many problems in our daily life. However, the levels of the problems we face will be different, McPeck (1981) mentioned that since critical thinking is always "thinking about X" which is referring to thinking about something, it follows that critical thinking is intimately connected with other fields of knowledge. As people begin to think critically to get an answer or give an opinion, it begins to associate with the knowledge that he has, dig for more detailed information so that the case will be conveyed does contain a truth value. On the surface at least, perhaps

some people will consider that critical thinking is that it involves a certain skepticism, or suspension of agreement towards a given explanation, built up standard or mode of doing things.

In addition, sometimes a critical thinker impressed by people who suspect a lot of things, even sometimes as impressed as judicious on others. However, it will give a negative impression to the critical thinkers, therefore we need to consider the mental process to avoid wrong interpretation. We need to learn how to be a critical thinker without having to impress selfish or self-righteous among others. Ennis (1995) stated that there are six elements that have a mental checklist for critical thinking known as FRISCO: Focus, Reasons, Inference, Situation, Clarity, and Overview. In approaching any situation, students have to be focused on identifying the main arguments or problem as guidance for students not to get distracted during the thinking process. These six basic elements refer to:

a. Focus (the conclusion to be reached); the first thing we need to figure out is the main point, issue, question or problem. Without knowing what exactly happens, what we thought will be bias or false. Start to question "what is going on here?", try to find the main idea with the problem that you need to solve, focus yourself on gathers information related to the problem.
b. Reasons (offered in support of a conclusion, decision made if they are acceptable); People must know the reasons that offered in support your own arguments or opinions, then decide whether the reasons are acceptable before you can make a final judgment about an argument. When formulating arguments, we need to seek the logical reason by looking the evidence. Lastly, we need to review the arguments, identify and judge the acceptability of the reasons that we made.
c. Inference (as we assume that the premises are true, a question emerges about a plausible alternative to the given conclusion); Interference is whether the reason, if it is acceptable would support the conclusion, and how strongly. Judge the interference is

different from judging the acceptability of the reasons. In critical thinking, we must do both. We must judge whether the reasons would be sufficient to establish the conclusion if the reasons acceptable

d. Situation (triggers the physical and the social environment, the one(s) who carry the burden of proof for the truthfulness of the premises and of the conclusion, and for the validity of the argument); The situation includes the people involved and their purposes, histories, a allegiances, knowledge, emotions, prejudices, group membership, and interests. This also includes the physical environment and the social environment, which in turn includes families, governments, institutions, religions, culture, employment, club and etc.

e. Clarity (stands for the expression "say what you mean and mean what you say" that refers to avoiding ambiguous communication); when you write and speak, it is important to be clear. People sometimes can't follow the ways your thinking, speak or behave, so make sure that everything you do is clear to others. It is important to make sure that all the messages that you send to others people are clear.

f. Overview (the review and the general checking of the previous five elements) means we need to check about what we had discovered, decided, considered, learned, and inferred. Put it all together and see whether it all still make sense, do it over and over again to check that the process and the conclusion of the judge are correct.

Based on the six elements, we might be aware that not every valuable cognitive and thinking process can define of as critical thinking. Critical thinking, problem-solving, decision making, and creative thinking is part of higher-order thinking. Thus, the ability to think critically not only simple skills but requires higher level thinking skills. Everyone can be express what they think but not everyone can indicate the quality of high-order level thinking, which is critical thinking skills.

2.2. Case studies

2.2.1 Definition of Case studies

Our community currently needs citizens especially student who are adaptable, innovative, and active in term of solve problems that related to the interests of many people. Furthermore, our education system encourage to facilitate student skills on making decisions, think critically, communicate and work efficiently within teams and groups. The mindset of only knowing and remembering information' is not enough to maintain with the increasingly complex, and the rapidly transformation world in which we live. To enhance life-long learning and potential achievement it is now broadly acknowledged that student need to shave chances to develop capabilities and effective thinking skills during their education period. Student educational experience might limited to exhibit more complex thinking skills and performance, while according to Fischer (1980) the development of complex thinking skills also depends on experiences. This statement leads to the important key to creating experiences and increasing performances on learning process is using appropriate strategies of teaching.

Follow the changing function of education, for the past decade there has been a noticeable movement from lecture-based activities towards student-centered learning. Following this movement, the utilization of case studies in education settings begin to be noticed and adapted to help students improve understanding of learning material. Using case studies method is a great methodology for create connection link between the learning environment and the real world with the improvement of cognitive skills and encouraging student them to be a problem solver in the learning process.

Yadav and Janna (2009) proved that there was a significant difference in the learning outcomes of students using conventional learning methods with case studies learning method. Case method challenge students to review a real-world situation (a case) that poses a thought-provoking problem or dilemma. The interaction between teacher and student as well as among

students in a group when they collecting, discussing and analysis decisions to present to the class is the characterized of case teaching. Through case studies method students has a chance to discover or construct knowledge rather than if student only as receiver of content and sit passively from a distant. A simple parable like a child learns to ride a bike by getting on it, fall sometimes until they can ride well. The same situation happen in class, students in a case-based course actively engage course material, when they get used with this technique, it will be encouraging student to continuously engage on content knowledge and improve student skills and competencies in reading, writing, speaking, listening, and critical thinking. How students see a problem from a science and experiential perspective, will help improve the reasoning power to solve the problem. The more complex a problem, it will require higher order thinking.

Case method lead interest and relevance to the application of abstract concepts and theory in practice. Students have to sort out and analyze data presented in the case, consider the relevant theory, draw conclusions, and present solutions. Using various activity that involve student on teamwork and whole-class discussion, collaborative learning plays a large role in uncovering different solutions, understanding the process and consequences each decision and weighing benefits. The cases that used in learning activity are not limited to large cases only; they can be any conditions or situations that compels students to come to terms with multi-layered problems seen from various perspectives and ideas. Case problem forcing student to build connection through direct and immediate intercourse between student and the subject-matter of interest. Case questions should raise the careful thought and avoid driving students to decide raw conclusions. During the case studies method, teacher help focus attention on specific aspects of the case and guiding students to discussion ruminations that will prove valuable during class (Golich, Boyer, Franko & Lamy 2012). In line, cases provoke students' critical thinking, describe how to think accurately and determine students to use theoretical concepts into a practical problem, therefore student can solve the case (Dowd &

Davidhizar, 1999). The features of case studies are as follows: cases are based on real-life scenarios, they provide supporting data and documents to be analyzed, and an open-ended question or problem is presented as a possible solution. Case studies can be presented to individuals or groups; most commonly, therefore student worked in groups involve brainstorm solution to the problem.

The case method can impact students with critical thinking, communication, and interpersonal skills by having an interactive, student-centered exploration of realistic and specific narratives that provide grist for inductive learning (Angelo & Boehrer, 2002). The case studies is defined as immersive exploration method of realities, presenting in investigative nature (Minniti, Melo, Oliveira, & Salles, 2016). We believe by applying the case method students will get positive benefits through learning process with the reason as following; 1) stimulate and challenge students to think, 2) give flexibility or freedom to take initiative and action, 3) facilitate students to solve a problem, 4) improve intuition and analytical skills in diagnosing cases 5) identify the data needed to solve the problem 6) scientifically communicating to the listeners. Therefore, the case studies as a teaching strategy empowers student experience on information gathering and analyzed situations by explore the scientific understanding which improve critical-thinking skills, and help students see how subject matter that they learn in school relates to their lives.

2.2.2 Case studies Combined with Concept Maps

Novak's study mentioned the impact of early instruction in learning and the essential use of concept maps as a representational tool for cognitive developmental changes by displaying the trajectory of their understanding of new concepts and ideas (Novak & Musonda 1991). Concept maps incorporate ideas in some circles or boxes, and connections between ideas

words or linking phrases, then specify the relationship between concepts (Novak & Cañas 2008).

Ausubel's (2000) puts several principles that explain how cognitive structure reform and elaborate on concept maps, which the first principle is meaningful learning which means student must look for approaches to relate new ideas and suggestions to existing relevant concepts and propositions that they already knows. Second, the student must have possess ideas and recommendations with an adequate level of clearness and propositions with a sufficient degree of clarity and stability to create new, significant ideas and suggestions Third, the material to be learned should be conceivably important, conceptually explicit and relatable to other ideas in this knowledge field. Thus, criteria is almost similar with meaningful learning traits according to Novaks (1998), first the learner has prior knowledge that is relevant to the new learning to be done. Second, what is to be learnt is presented in ways that have meaning and third the learner must choose to learn meaningfully. Concept mapping has powerful utility for the demonstration of learning, it can be used to display individual knowledge structures for comparison at different stages of the learning process and to distinguish between expert and novice knowledge structures (Novak & Symington, 1982).

Engage students on creating concept maps can facilitate insights into how to organize and represent knowledge. This can be a useful strategy for assessing both the thinking and student developing knowledge of course material. A decent case entertain classroom discourse endless through practice solving real problem in real life situations (Lawrence, 2010). As student "occupy" with a case, they must tease out the key components from the real chaos of opposing and confused data (Golich et al., 2000). Cases compel students to:

a. distinguish pertinent from peripheral information,
b. identify the problem(s) at hand and define its context and parameters,
c. identify a set of possible solutions,

d. formulate strategies and recommendations for action,

e. make decisions, and

f. Solve obstacles to implementation.

One of the reason teachers develop case studies as their teaching strategy is student not only understand the theoretical background of every subject matter, furthermore student can practice and solve the problem simultaneously. Good cases are consisted with clear data and expect information, then require students to apply text-based theory to analyze complicated real-world events that requires deeper understanding and improved retention. Additionally, using case studies combined with concept maps can promote a strategy for nurturing critical thinking. Based on assimilation theory integrates in Ausubel's cognitive psychology that learning takes place by the assimilation of new concepts and propositions into existing concept and propositional frameworks held by the learner (Novak & Canas, 2006).

To our brain it is natural to do some multitask thinking and to perceive the information simultaneously. When we look at a picture, we see it all at once as a composite image that consists of different details and features. People normally think in picture, or rather collections of images and associations. For example, when we see Colonel Sanders, you will think of fried chicken, then of fries and cola. On the whole, create concept maps are extremely normal for our mind as they have comparative association structure. That is the reason utilizing these maps can enhance all the processes connected to our brain activity, including studying processes. Here is the advantage of making notes with mind maps:

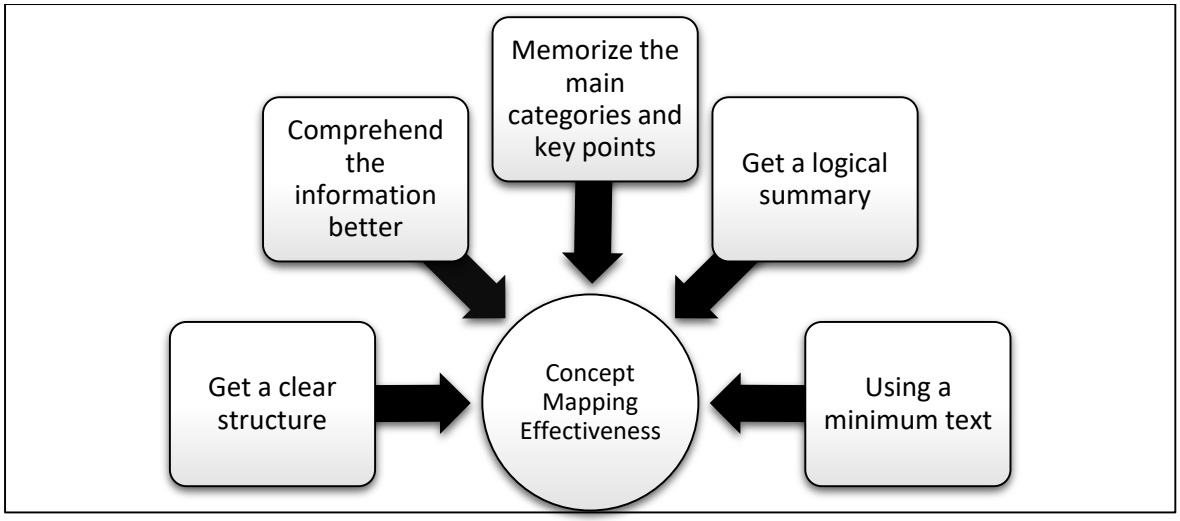


Figure 2.2 The Advantage of Concept Maps

Research suggested that concept mapping could be utilized as an effective method in improve critical thinking (Wahl and Thompson, 2013; Wheeler, and Collins, 2003). Concept maps consist of concept labels that identify specific ideas (concepts) and the links between them, which explain how concepts are related to make meaning (Hay, 2007). Thus, concept maps comprise any number of propositional statements, each of them made up of paired and linked concepts, where each proposition is a statement of understanding and the validity of each assertion is laid bare (Hay, Wells & Kinchn, 2007)

Concept mapping can be used to transform abstract knowledge and understanding into concrete visual representations that are amenable to comparison and measurement, in addition concept maps also a tools for integration of new material and the prior-knowledge structure, that meet the criteria of meaningful learning (Hay, 2007). Huang et al study (2012) purpose to examine the effects of a program of case studies, alone (CS) or combined with concept maps (CSCM), on improving critical thinking in clinical setting with nurse as the participants. This study examination the utilization of case studies combined with concept maps as a teaching strategy to promote the development of critical thinking skills and encourage dispositions for nurses.

2.2.3 Case studies with Preparatory Training

A skilled researcher's still demands on solve a practical case studies, a skilled researcher is able to motivated the stud process, and understand the reality investigated. The case studies as a teaching strategy must be guide by the experienced instructor. Case studies method promote learning by engaging students in very effective and efficient ways. Case studies fluctuate on long and detail and can be utilized as a part of various courses, contingent upon the case itself and on the educator's objectives. The process of case creation is a complex educational system and is carried out in several stages (Beckisheva, Gayane, Gasparyan & Natalia, 2015), which are:

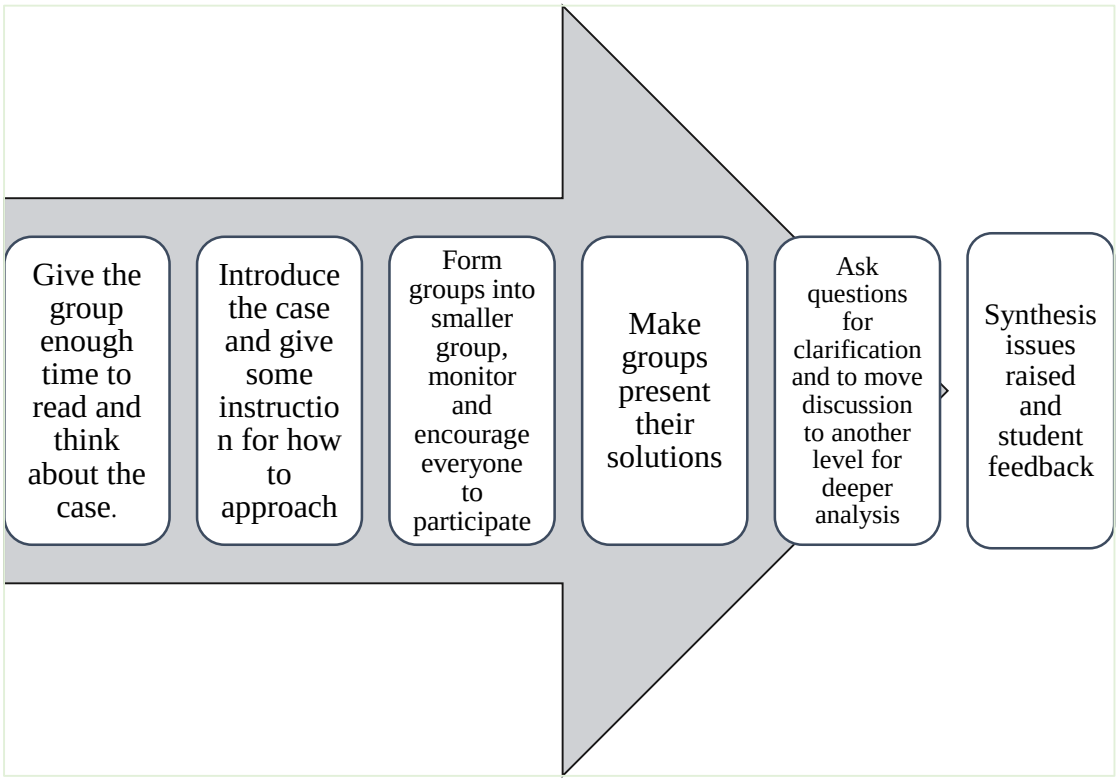


Figure 2.3 Case studies Activity Steps

Case-based instruction emphasizes on giving instruction on how to analyze and solve a cases that illustrates in a ways which it can be implemented in the classroom. A case might

consist with multiple problems that enables the instructor to focus on problem analysis as a key learning outcome. This approach is embrace on identifying the problem, enumerating possible solutions, establishing criteria to be incorporated in the solution that is selected, and selecting the solution along with the supporting rationale makes for an important experiences (Swanson & Morris, 2010). Furthermore, Pomykalski (2010) focus on the important step on solving a case is reading carefully, this process enrich the understanding about the main problem in a case. In details there are some step needs to training case studies (a) student need to read quickly and then careful the case (2) students should identify the key issues in the case, the major players in the case, and a list of facts related to the key issues (3) formal written analysis of the case based on the content of the course and the issues raised in the case (4) conclusions with clear answer or recommendations (Pomykalski, 2010).

The case studies lead by experienced teacher with the knowledge of how to conduct a case studies method. Therefore teacher will help learner to engage and answer if student find the difficulty on their ways. In this study, training students to know in advance the steps in solving a case, will increase confidence when dealing directly with the problem. The preparatory training provides the foundation keys on how to find the key issues relevant to the problems posed in the case. The training help students on understanding the basic step to solving the complexity scenario. Due this training students have a chance to develop confidence on how solve more complex problems as well as enhance their knowledge on case studies activity itself. In this research, we use theories from Beckisheva et al., (2015) and Swanson (2010) we formulate the process of preparatory training of case studies carried out in several stage as show in this figure below:

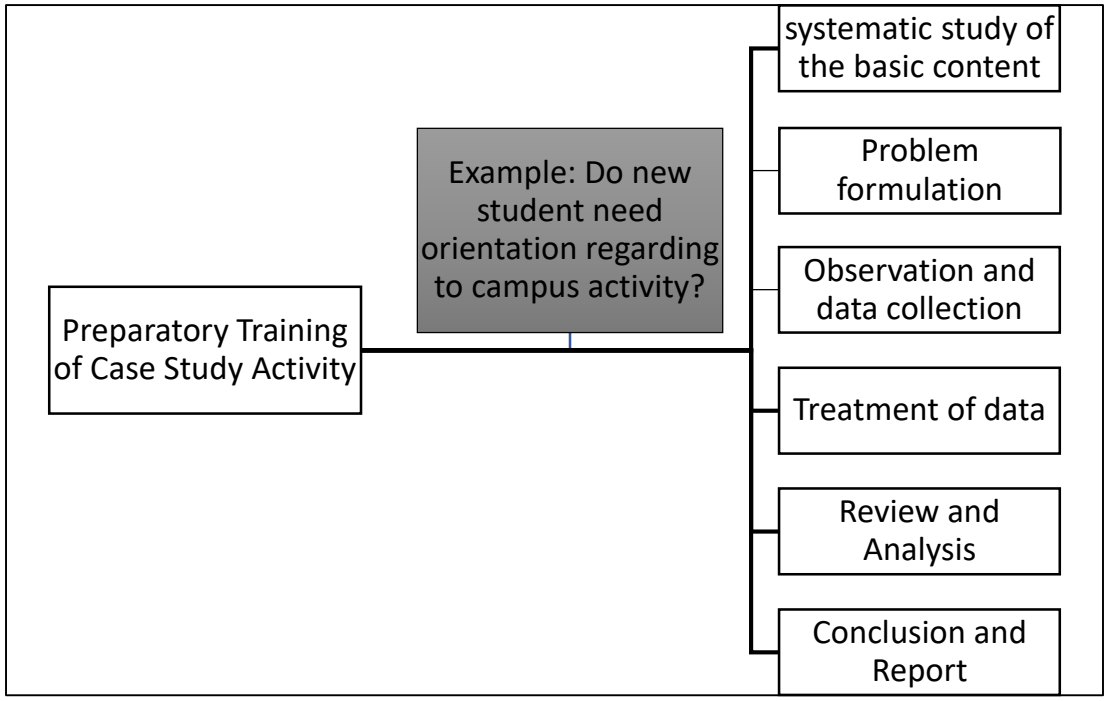


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Figure 2.4 Process of Preparatory Training of Case

2.3 Strategies and methods of teaching critical thinking to college students

As Zoller and Pushkin (2007) stated that critical thinking is logical thinking, rational, reflective and evaluative that directs individuals to the decision whether an individual will accept or reject something and what to believe. In line, Halpern (2015) states that the operational definition of critical thinking is to use abilities on increasing the possibility of achieving the expected results. It is used to direct the thinking process to a purpose. Through critical thinking process, the individual will also evaluate whether the results of his thinking process has been able to solve existing problem. Tama (1989) stated that critical thinking leads to a way of thinking individuals who require support to a trust. The thought is difficult to be affected unless the support is given consistently. Critical thinking emphasizes the process of thinking, which are concerned more with teaching how to think than with teaching what to think (Ennis & Norris, 1989). Critical thinking is a process used to deal with some content, which might be part of school subject or of situation or problem in daily life

Watson and Glaser (2002) add that critical thinking can be defined in three main aspects. First, an attitude looking information that involves the ability to recognize and accept the information and facts right. Second, knowledge of how the deduction, inductive reasoning, generalization valid involving the accuracy of the facts logically and third is expertise used and applied either in attitude or knowledge. However, teaching people to think critically is a challenge. Thinking critically does not mean "knowing everything"; simply memorizing information will not help a student to become a critical thinker (Popil, 2000)

Significant changes in the past decades in the education field, regarding how on what and how to teach. Today's education moves to a new frame which known as active learning that accentuates students learn best when they actively participate in the learning process. By engaging students in their learning, increases their attention and focus, opportunities for student engagement in the learning process, motivates them to practice higher-level critical thinking skills and promotes meaningful learning experiences.

Case studies noticed to be useful pedagogical tools by some educational research. One of the benefits of using case studies as an interactive learning strategy that emphasis to more student-centered activities (Grant, 1997). Another research demonstrates the significant effect of using case studies in engineering education to help students to face the real-world problem (Raju and Sanker, 1999). The last two decades, study about case studies show some popularity in the education setting for a number of reasons, like the format usually present relatable scenarios that encourage student interactions, critical thinking and problem-solving skills (Herreid, 2007) increased student motivation and interest in a subject (Mustoe & Croft, 1999) and useful in helping students to remember details and facts (Beyea, 2004).

Case studies method of learning relies upon inductive thinking by making content the specific establishment of a case course. Students trained to listen and read carefully to case, to respect opinions of others student, and to work collectively to analyze a problem. During this

activity students strengthening their own ability to think critically and communicate effectively. Golich et al. (2000) mention the case method are consistent with a philosophy of teaching that:

a. assumes a major goal of higher education is to empower students to think critically and act responsibly in their various roles at work, at home, and in their communities;
b. asserts that students must be able to apply the collection of concepts and facts they learned to new situations; and
c. posits that integrating knowledge from other classes and/or life experiences is important

Research conducted by Minniti et al., (2016) found that case studies help to develop the arguments to a point of view. The case studies is defined as an in-depth exploration method of realities (cases); presenting investigative analyses enables the experience of data collection, its systematization and difficulties by placing the student in the context where the phenomenon analyzed happens or expressed promotes critical thinking, encourages debates and stimulates teacher and students interaction. Mayo (2004) described the benefits of case-based instruction (CBI), in objective testing indicate that students exposed to CBI outperformed those in the control on comprehension and application of course principles by engaging class discussions provided evidence of varied conceptual applications by students to bridge a gap between theory and practice.

Case studies allow students to "experience" real situations by offering the chance for direct data analysis that includes consideration of the outcomes. The direct application of the case studies is establishes a framework for analysis of the case that required students to make critical and objective judgement and able to distinguish how to apply those arrangements in other comparable circumstances. While, concept mapping can be used to make abstract knowledge and understanding visible to underpin its utility (Hay, 2007). Combining these two techniques will help students see a problem clearly, formulate the root of the problem, look for

causal factors and produce conclusions, which this process helps students sharpen critical thinking skills.

Summary

Critical thinking is one of desirable purpose of most higher education institutions to reach. The literature proposes that critical thinking hypotheses and models can manage the advancement and evaluation of critical thinking skills for higher education students. Various researchers have examined the effects of a case studies with concept maps on critical thinking skills and dispositions, Huang et al., study (2012) support the application of case studies combined with concept maps as a teaching strategy to promote the development of critical thinking skills and encourage dispositions for nurses. Providing student with concept maps would thus be an approach to guide and focus them on problems relating to cases, therefore involve greater contributions than case studies alone.

This study investigates whether case studies with concept maps and preparatory training of case studies activity approaches impact the development of critical thinking skills for undergraduate student. This study may advance the empirical research regarding case studies with concept maps and preparatory training of case studies activity approaches and the results may produce supplementary information of critical thinking research specific to this approaches.

CHAPTER 3

METHOD

Chapter 3 outlines the study methodology and is proposed in six section. The first section present the participating institution. The second part describes the methodology for choosing the subject example and student participants. The third section describes the instruments that utilized as a part of the research study. The fourth section traces the experimental plan and data gathering methodology utilized as a part of the examination. The fifth section present the validity and reliability of the instruments, continues with methods and procedures for data analysis. In this study, students' critical thinking skills and dispositions were developed through a case studies with combined with concept maps for Experiment 1 and for Experiment 2 we used preparatory training for a case studies as a treatment.

3.1 Institutional Setting

The study was conducted at Medan State University, Indonesia. This institution was selected for because the researcher is a faculty member in the department of educational psychology and guidance. The administration showed willingness to give a chance to conduct an experiment on teaching class also to help participate in the study if needed. Experiment 1 was conducted mid-July until mid-October 2016, while Experiment 2 was conducted from July until September (2017).

3.2 Research Participants

The accessible population for this study consisted of first-year students of the university that enrolled for the subject *Introduction to Psychology*. Students enrolled in each class have been selected by the university system according to the university policies and rules therefore it difficult to randomly assigned to a particular treatment group. However, we made some policies to standardize the treatment effect on improving critical thinking, especially for the Experiment 1.

a. For Experiment 1, participants were 75 undergraduate students of a public university in Indonesia, which was divided into three classes, each of three classes consisted of 25 students. However, there is a difference regarding the exam entrance between the three classes in this experiment. There were two classes that had passed the National Exam entrance procedure, and there was one class that had passed the University Exam entrance procedure. There is a difference in difficulty level due to the type of exam student's tool to gain entry to the university. In general, the national exam required a higher test score than the University exam entrance. We choose the class with the university exam entrance for the group that has the case studies with concept maps, as this group was expected to show the greatest improvement among the three groups. The three groups participated in lectures with the same class objectives and content for 8 learning sessions. The only difference was the educational strategy; Case Studies Combined with Concept Maps (CSCM) were used for the first group, only Case Studies (CS) were used for the second group, and the third group was a Control Group which received the regular class with no specific active learning techniques. Supplementary to case studies, concept maps are provide a teaching strategy for nurturing critical thinking. Students can visualize relationships among concepts relevant to the subject matter by using the FreeMind software to help the student create concept maps. The

reason why we choose to use Freemind software as a tools to helps student is this software is impressive mind mapping program that has improved significantly and well known in just a few years in education setting. Despite the facts that this is a free software, it is also well-suited to student with fairly basic visual diagramming skills, therefore training student on how to use this program is more time efficient. All participants undertook an assessment of their critical thinking skills using The Cornell Critical Thinking Level Z test and also of their critical thinking disposition using the University of Florida Engagement Cognitive Maturity and Innovativeness assessment (UF-EMI) before (pretest) and after completion of all learning sessions (posttest).

b. For Experiment 2 participants included 115 undergraduate students of a public university in Indonesia, which was divided into four classes. However, for Experiment 2, which was conducted in 2017, a different policy regarding exam entrance had been instituted by the National Government which only permitted the national exam entrance for entering the public university, therefore all groups in Experiment 2 were considered equal with regard to the exam entrance. Experiment 2 was an extension of the Experiment 1 results. As the participants in this study were first-year students, it was expected that they would not be familiar with learning provided by case studies activities, since active learning methods were uncommon or unknown in most high schools in Indonesia. The four groups participated in lectures with the same class objectives and contents for 8 learning sessions. The only difference was the educational strategy; Case Studies Combined with Concept Maps (CSCM) were used for the first group, Case studies with the Preparatory Training (CS Training) was used for the second group, Case Studies (CS) alone were used for the third group, and the last group was a Control Group which only received the regular class with no specific active learning techniques. All participants received an assessment of their critical thinking

skills using The Cornell Critical Thinking Level Z test and their critical thinking disposition using the University of Florida Engagement Cognitive Maturity and Innovativeness assessment (UF-EMI) before (pretest) and after completion of all learning sessions (posttest). In addition, for Experiment 2 we also used the Student Activity Observation method to monitor student progress and the engagement of each student in the learning activity. To do this, we involved other professional teachers to help observe and record student activity and behavior during the experiment. However, these teachers were not informed about the treatment of each class to avoid biases.

3.3 Instruments

One of the major issued in developing treatment to increase students' critical thinking skills is assessment. Results obtained with three instruments were used to compare the effectiveness of the experimental treatment in this study, which are a) Cornell Critical Thinking Level Z test measure participant's skills in argument analysis of an daily issues and task b) The University of Florida Engagement Maturity Innovativeness questionnaire measure the dispositions toward critical thinking and c) student activity observation sheet. Knowledge of *Introduction to Psychology* content was given both at the beginning of the semester until meeting 8. Below the explanation regarding the instruments that used in this research.

a. The Cornell Level Z Critical Thinking Test. To assess the progress of advance on critical thinking skills in participants, we used The Cornell Critical Thinking Test (CCTT) Level Z. This instrument is a fully developed and legitimate testing instrument (Saegar, 2014), therefore no pilot study was conducted to test the adequacy of the testing instrument. The CCCT Level Z depends on an origination of critical thinking described in various stages of refinement and emphasis by Robert H Ennis. The

administration of the CCCT Level Z instrument administered in classroom setting using a test booklet and fillable scan sheets. Due my experience in supervising standardized tests, therefore no pilot was conducted to test the procedures of administering the test. The CCCT Level Z test contained 52 items, all of which are in a forced-choice format. Based on the statement students then choose if the conclusions follow logically, contradict or do neither. The scoring format used the total number of correct answers. The CCCT Level Z is formulated especially for gifted high school students, undergraduates, graduate students, and adults. This test measures critical thinking skills dimensions, which are induction, deduction, observation, credibility, assumptions, and meaning (Ennis et al., 2005).

Based on Ennis et al., (2015), there was considerable overlap and interdependence among these in the actual process of critical thinking although aspects of critical thinking are listed separately. For example, the assumption aspect of critical thinking is listed under both assumption and deduction question items "because the deduction is useful in identifying likely candidates for an assumption in a given line of reasoning". The Cornell Critical Thinking Test provides a specific 50-minute time limit for the Level Z test and based on multiple previous tests, more than 90% of students taking Level Z should finish in 50 minutes, therefore the test that we conducted was administered in a 50-minute, face-to-face setting using printed testing booklets with fillable scan sheets to record answers (Ennis, et al., 2015).

Table 3.1 Aspects of Critical Thinking Incorporated in Level Z and Rough Assignment of Items

No	Aspects of Critical Thinking	Items of Level Z
1.	Induction	17,-26-42
2.	Deduction	1-10,-39-52
3.	Observation	22-25
4.	Credibility	22-25
5.	Assumptions	43-52
6.	Meaning	11-21,-43-46

b. The University of Florida Engagement, Maturity, and Innovativeness.

The development of the University of Florida Engagement Maturity and Innovativeness (UF EMI) test began in 2000 when Rudd, Baker, and Hoover (2000) determined that some critical thinking disposition constructs were not represented in the California Critical Thinking Disposition (CCTDI). Their work with over 174 subjects failed to produce the critical thinking dispositions constructs that Facione et al., (1995) had proposed. Therefore, it drive others researchers to expand an assessment that able measures critical thinking precisely. In detail, the CCTDI instrument was created based on seven critical thinking dispositions created by Facione, Giancarlo, Facione, and Gainen (1995) to explore whether a person routinely perform the attitude of an ideal critical thinker. The way individuals perform and demonstrate certain characteristics of critical thinking show whether a person is a strong critical thinker or not. Furthermore, Rudd, Moore, and Penfield conducted a factor analysis of the California Critical Thinking Disposition Inventory in 2002 and resume that the constructs develop in Facione's study were not cover all the critical thinking disposition dimension. Furthemore, they developed an instrument based on the analysis result. The instrument name created from the university where the researchers affiliated, combined with the English initials of the each sub dimensions of the instrument UF/EMI (University of Florida Engagement, Maturity and Innovativeness). This instrument was developed and conducted the pilot-tested around 2003. The final version of the University of Florida Engagement, Maturity and Innovativeness scale was developed by Ricketts and Rudd (2005). The instrument is a five-point Likert Scale and designed to measure three dimension of critical thinking disposition, which are engagement, cognitive maturity, and innovativeness. Individuals with high engagement inclination accept that well-

thinking is always necessary, justify their thinking skills and seek an opportunity to use their thinking skills for problem-solving and decision-making. Individuals who are aware that many problems are more complex than their superficial appearance are considered as having high cognitive maturity. High innovativeness disposition is best described as "eager for learning" (Ricketts and Rudd, 2005).

Pilot Testing of UF EMI

Before the University of Florida Engagement Maturity, Innovativeness instrument was administered to the participants, a pilot study was conducted to help the researcher minimize any ambiguity for the participants, as the survey was adapted from its origin development in the United States for Indonesian students. Preceding the pilot test, the instrument translation was needed due the student of this study were Indonesian native. The survey was translated into Indonesian using assistance from Indonesian lecturers who teach English. During this process, the translators and researcher communicated regularly to ensure the accuracy and objective of this instrument. According to Johanson & Brooks (2009) thirty participants was the minimum participants to conduct a pilot study. Meanwhile for this research, we involved 207 participants for UF EMI pilot study. The duration of the pilot study was around three weeks.

c. **Student Activity Observation Sheet** is an observation assessment for gathering data through student learning activity. Student activity observation sheet is quite objective and typically do not push the observer to make any high judgments about the behaviors they observe in the classroom. This tools also provided specific and easy identifiable behaviors that observers watch in classroom. This tools is fundamental and effective plan to monitor and evaluate student activity during learning process. Student Activity Observation Sheet used to assess the

implementation and effectiveness of teaching strategies through classroom observations that are created for individual, groups or whole class learning needs. This assessment also count strengths and needs of each student, therefore the data collected will helps highlight discrepancies for further investigation. The observer records certain aspects and activity that students and teachers do during an experimental study using student activity observation. In this research a student activity observation sheet was given only for Experiment 2, the student activity observation sheet was used to record individual student behaviors that significantly related to students' case studies activity or learning activity. The instrument consists of 10 observation items that are completed by the observer (another lecturer) based on the behaviors that students displayed during the class activity. The student observation sheet was given at each of the two meetings, it is expected that with this stipulation the student's behavior changes might be more obvious.

3.4 Validity and Reliability

a. Reliability estimates for Cornell Critical Thinking Level Z, using the Spearman-Brown approach, have ranged from 0.49 to 0.87 (Ennis et al., 2005). Another measure of internal consistency is the set of correlations between parts of the test and the total score found for KR-18 estimates for Level Z were 0.76, 0.66, 0.60, 0.55, 0.72, 0.65, and 0.65 with an overall total score of 0.76 (p.17). The validity of the Level Z test is based on criterion-related evidence and the correlation between the Level Z test and other critical thinking and reasoning tests. Seven correlations between Level Z and other critical thinking tests ranged around 0.50" which indicated a "reasonable degree of relationship, given the differences in approach of different test makers" (p. 32). The relationships between Level Z and other variables, and the consistency and generalizability of these

relationships, provide strong support for the construct validity of Level Z" (Ennis et al., 2005).

b. UF EMI. The pilot test was conducted with 207 undergraduate students selected to take the disposition test. The students filled that the 26 item that took from 5-10 minutes. The data were entered into an Excel spreadsheet/workbook and then analyze with SPSS. From the origin 26 item critical thinking disposition test, item and scale reliability analysis showed an overall Cronbach's alpha of 0.88. The Engagement construct was described by 11 items and a standardized Cronbach's alpha of 0.73, the Maturity construct was described by 8 items and a standardized Cronbach's alpha of 0.69, and the Innovativeness construct was represented by 7 items and a standardized Cronbach's alpha of 0.702, which all of these reliability ratings were deemed average. Item-total correlation (r) were also calculated to determine the distinctiveness of each item of the EMI as shown in table 3.2.

Table 3.2 Critical Thinking Dispositions (UF-EMI) Test Item Analysis

Items	Means	SD	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I1	3.65	.66	.396	.873
E2	3.98	.77	.338	.875
E3	4.07	.79	.454	.872
M4	3.75	.77	.426	.872
E5	4.27	.78	.234	.877
M6	3.48	.77	.336	.875
E7	3.38	.78	.468	.871
E8	3.80	.83	.453	.872
E9	3.65	.91	.394	.874
M10	3.45	.83	.514	.870
M11	3.63	.77	.376	.874
M12	3.17	.93	.481	.871
I13	3.39	.82	.553	.869
E14	3.88	.82	.430	.872
M15	3.43	.91	.393	.874
I16	3.56	.83	.562	.869
E17	3.98	.75	.476	.871
E18	3.81	.83	.475	.871
E19	3.74	.84	.458	.872
I20	3.95	.85	.400	.873
M21	3.72	.83	.410	.873
E22	3.80	.87	.343	.875
M23	3.76	.72	.496	.871
I24	3.72	.78	.431	.872
I25	4.12	.77	.509	.870
I26	4.02	.75	.478	.871

Note : E = Engagement, M = Maturity, I = Innovativeness

3.5 Design and Procedure

A quasi-experimental design was used in this study for Experiment 1 and 2. This experiment used pre-test and post-test design with three groups for Experiment 1 and four groups for Experiment 2. The Cornell Critical Thinking Level Z test, and the assessment from the University of Florida Engagement, Maturity and Innovativeness test were used to collect the data at two score in each time (pretest and posttest). The researcher taught eight learning sessions to all experimental groups and the Control Group. The experiment conducted in 100 minutes of classroom instruction per week for 8 weeks for both experimental and Control Groups with three additional meeting were needed for the pretest, posttest and training the experimental groups about case studies with concept maps for Experiment 1 and preparatory training for experimental group for Experiment 2. The topics and cases for each meeting are outlined in Table 3.3 below.

Table 3.3 Case studies Topics and Cases

Topic	Sub-Topic	Case
Basic Principles of Learning	a. Classical Conditioning : Learning by Association b. Operant Condtiong: Learning from the Consequences of your Behavior c. Extinction: Learning when to quit d. Theoretical Interpretations of learning	Does punishment help to shape child behavior? Support your opinion with reasons.
Developmental Psychology	a. Basic Processes of Development b. Stage Theories of Development c. The Concept of Development across the Life Span d. Adolescent Development	A woman was dying. There was one drug might save her that was made by one man and it cost 200 dollars. The lady's husband just quit his job and he has only 100 dollars. He came to the man who made the drug and said his wife was dying and asked him to sell the medicine

	e. Adulthood: Young Adulthood through Older Adulthood	cheaper or let him pay later. However, the man refused it immediately. Then, The man broke into the store and stole the drug. Did the man do the right/ wrong thing? Support your answer with reasons.
Motivation and Emotion	a. Primary motives: Biological needs b. Psychological Motives c. Emotions d. Aggression : Emotional and Motivational Aspects	There are two people who are equally rich. One person likes to buy fancy things, always wore branded items and went abroad, while the other person only bought basic and necessary things and donated to charity. What do you think the cause of different act between these two people? Support your opinion with reasons.
Personality Theories	a. Definition of Personality b. Trait Theory c. Psychoanalytic Theory: Sigmund Freud d. Social Learning Theory: Albert Bandura e. Humanistic Theory: Maslow and Rogers f. Personality Assessment	A woman was found by police after she killed three of her children. The woman confessed that she hears voices that suggest her to save her children by sending them to a better place, the woman said that she is not guilty because she did not murder on purpose. What do you think of the woman alibi, Can we trust her? Support your opinion with reasons.
Stress and Health	a. Stress: Challenges to Coping b. Factors that Influence Reaction to Stress c. Coping with Stress d. Changing: Health-related behavior patterns	Two siblings whose parents are divorced showed different reactions. The older seems really depressed, easily gets a migraine and likes to be alone, while the other seems to try to always be around his friends and is more open about his feeling. What do you think is the reason that caused this sibling reacts to stress is different?
Gender and Sexuality	a. Gender and Sexual Orientation	In our country (Indonesia), LGBT is taboo and not really accepted by society. Some have said that if we are open to the LGBT movement it will

	b. Biological and Psychological Aspects of Sexuality c. Atypical and Abnormal Sexual Behavior d. Sexual Dysfunction and Sexual Health	cause the increasing number of LGBT because they believe that LGBT behaviors can be learnt by imitation with the group. What do you think of this statement? Support your opinion with reasons.
Abnormal Psychology	a. Definition of Abnormal behavior b. Anxiety disorder c. Somatoform Disorders d. Dissociative Disorders e. Mood Disorder f. Schizophrenia and Delusional Disorder	Some people stream a live video on social media while they do some inappropriate behavior like sexual video or some people even recorded when they killed themselves. Do you think this kind of act includes abnormal behavior? Support your opinion with reasons.
Social Psychology	a. Group and Social Influence b. Attitude and Percussion c. Humanistic Psychotherapy d. Behavior Therapy e. Cognitive Therapy f. Other Approaches and Models of Therapy	As we saw in media, people in a crowd judged someone that was suspect of having committed a theft. The crowd beat and even burned a person who they're suspect of having committed theft without substantiated evidence or clarifying with the police. Why do you think a person in the crowd has a tendency to copy the crowd values even if the value is not right? Support your opinion with reasons.

The first week of class start with pretesting and choosing topic for each group. For participant who missed the pretest were required to take it in the admissions office for Educational Psychology and Guidance. During the experimental study, the instructional model, materials, procedures, and assessment instruments designated to use in the research project were applied. The design and procedure for both experiments in this research are described in more detail in the next chapter (Chapter four).

3.6 Method of Analysis

Data collected through the instrument and after the scoring process, was entered into a text file. Further, the text file was transferred to a Microsoft Excel™ spreadsheet/workbook, and then the data collected from this study was analyzed using SPSS™. The Cornell Critical Thinking Level Z Test and UF EMI data were entered into an Excel file before being analyze with SPSS. Means and standard deviations of critical thinking skills and disposition scores were calculated. Two-way ANOVA statistics were conducted to understand if there is an interaction between the two independent variables on the dependent variable.

Summary

This study investigate if exposure to case studies with concept maps and preparatory training approaches develop critical thinking skills and dispositions among undergraduates student. The Cornell Critical Thinking Test Level Z and UF EMI was administered in class to students with paper pencil format. Then data collected before analyzed using ANOVA, the result of this study are presented in the Chapter fiour. Chapter four consist with a brief outline of the section, results and overall conclusion of the study.

CHAPTER 4

EXPERIMENTAL STUDY

Chapter 4 is organizing in terms of the four specific research questions posed in chapter 1 for Experiment 1 and Experiment 2. It first reports the introduction and design of Experiment 1 and 2, result of total measurement critical thinking skill and disposition scores for each experiment. Specifically, this study sought to:

a. To determine whether the group of a case studies with concept maps students who receive explicit training in using FreeMind application score perform better on Cornell Critical Thinking test.
b. To determine whether a group of a case studies with concept maps students who receive explicit training in using FreeMind application show better score on University of Florida Engagement, Maturity and Innovativeness (UF-EMI) compares than case studies and Control Group.
c. To determine whether a group of case studies students who receive a case to solve perform better on Cornell Critical Thinking Level Z test.
d. To examine the effect of case studies on the University of Florida Engagement, Maturity and Innovativeness (UF-EMI) compares to the Control Group
e. To determine whether a group of a case studies with concept map students who receive training in using FreeMind application perform better on a Cornell Critical Thinking Level Z compares than case studies with preparatory training, case studies alone and Control Group
f. To predict a group of student who receives preparatory training of case studies perform better on Cornell Critical Thinking Level Z compares than case studies and Control Group.

g. To examine whether a group of student who receives preparatory training of case studies for critical thinking score higher in Engagement, Maturity and Innovativeness (UF-EMI) compares than case studies and Control Group.

h. To predict whether a students presented with a case studies in combination with concept maps perform better engagement and perform in learning activity compares to others group on Student Activity Observation Sheet?

4.1 Experiment 1

4.1.1 Introduction of Experiment 1

The purpose of the Experiment 1 is to examine whether case studies with concepts maps increase critical thinking skills and dispositions. Research about case studies combined with concept maps to improve critical thinking is still rare in Indonesia. Meanwhile as mentioned in chapter 1 promotion of students' critical thinking is a major goal in societies and has been the focus of educational studies and plays an important role in human's different life aspects, in this case educational setting need to focus on choose the reliable method that impact on student ability in thinking process. Based on previous research mentioned about the effectiveness using case studies on improving critical thinking, while research about case studies combined with concept maps is not really common. One research that using case studies with concept maps was conducted by Huang et al., (2012) however the research is conducted in nursing setting, therefore in this study we try to examine the effect of case studies combined with concept maps on improving critical thinking skills and disposition among Indonesian college students especially for guidance and counseling students.

4.1.2 Method of Experiment 1

This experiment used pre-test and post-test design with 3 groups. Each group will consisted of 25 students and all group had same class objectives and contents in 8 meeting. The only difference was the educational strategy; the first group used case studies combined with concept maps CSCM, the second group is case studies (CS), and a third group is a Control Group, which only have the regular class. Each group filled the assessment for critical thinking skills (The Cornell Critical Thinking Level Z) and critical thinking disposition (University of Florida Engagement Cognitive Maturity and Innovativeness assessment (UF-EMI) for pretest and posttest.

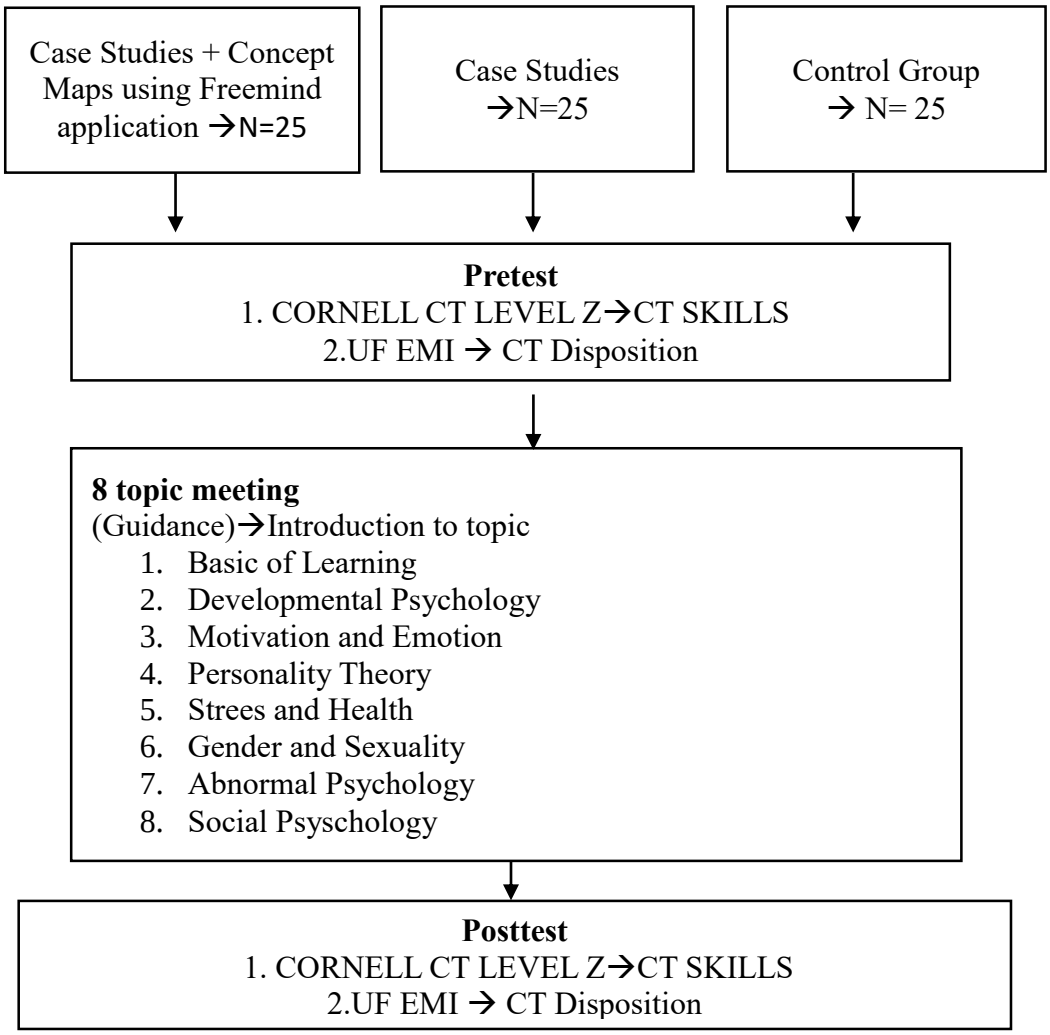


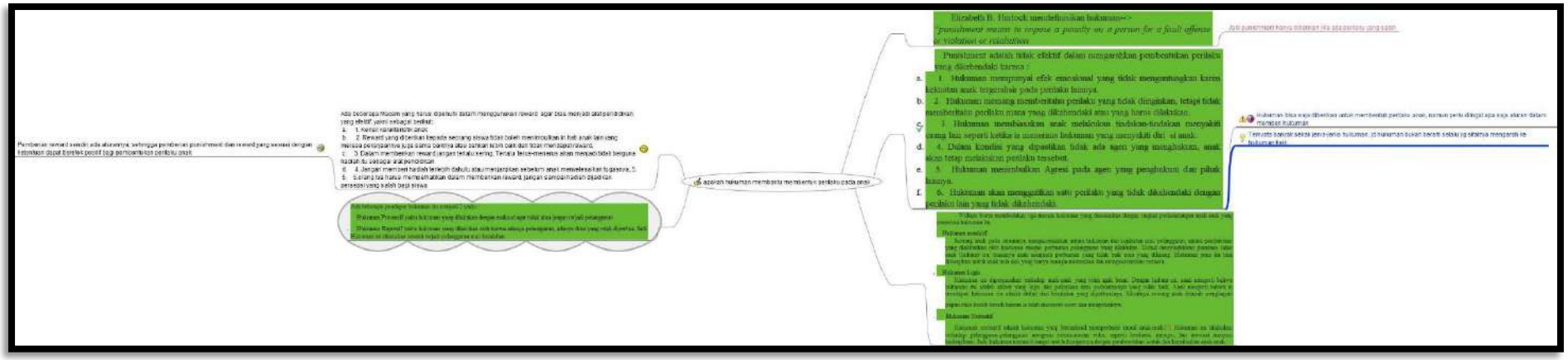
Figure 4.1 Design of Experiment 1

The treatment for a CSCM group divided into several steps, below:

1. At the beginning, student participated in FreeMind application training, therefore student has knowledge and experience on how to manage the application and apply it to a case.
2. At the third meeting (the second meeting is pretest), Student divided into 6 groups consist of a 4-5 student. The instructor asked each group to picked one topic among eight topics for their presentation. Then each group prepared the presentation paper and power point to present at every meeting, one topic for each meeting. Meanwhile, others group that did not present the topic assigned to read the material before the class

meeting. Therefore, students has basic knowledge about the topic on each meeting. The main book that used for this course is *Atkinson and Hilgard's Iintroduction to Psychology* (Hilgard, Atkinson & Atkinson, 2014).

3. In each meeting, the activity consists of :
    a. Started by group presentation (25min) about the topic. One group that already assigned on the selected topic in each meeting, presented their paper in power point. They explained an information about the topic based on their review on the main book and others sources that related.
    b. Then discussed the topic (15min). Student might asked few questions to presenter group related to the material and information that the presenter group presented before. Others student that not in the presenter group might gave their ideas, answers and opinions toward other student question.
    c. The instructor gave a case to solve. At first, the instructor divided the group into three pro groups and three contra groups, then they were offered the case to studies. Furthermore, instructor asked students to think logically, critically to solving the case (30min). The CSCM group used the Freemind application to helps them visualize the connection and mind mapping to solving the case. Case example: Does punishment helps shaping children behavior? Students asked to support their opinion with theories.
    d. Each group had explained their answer (2min). Then instructor asked groups after hearing other groups' opinion, does the group think that their explanation about the topic is enough or they prefer to change their opinion. Each group had one minute to explained about their view after group hearing stage (in total around 20min)
    e. Reflection and discussion (10min).



Figre 4.2 Example of Freemind Application

Meanwhile, for the CS group, they also had almost similar activity in each meeting, the difference is the case studies group do not have any kind of training before the class started. Furthermore, for the Control Group, we did not give any special treatment, only regular lecturing class was given. The table below describes the outline of each meeting for a case studies with concept maps and case studies group.

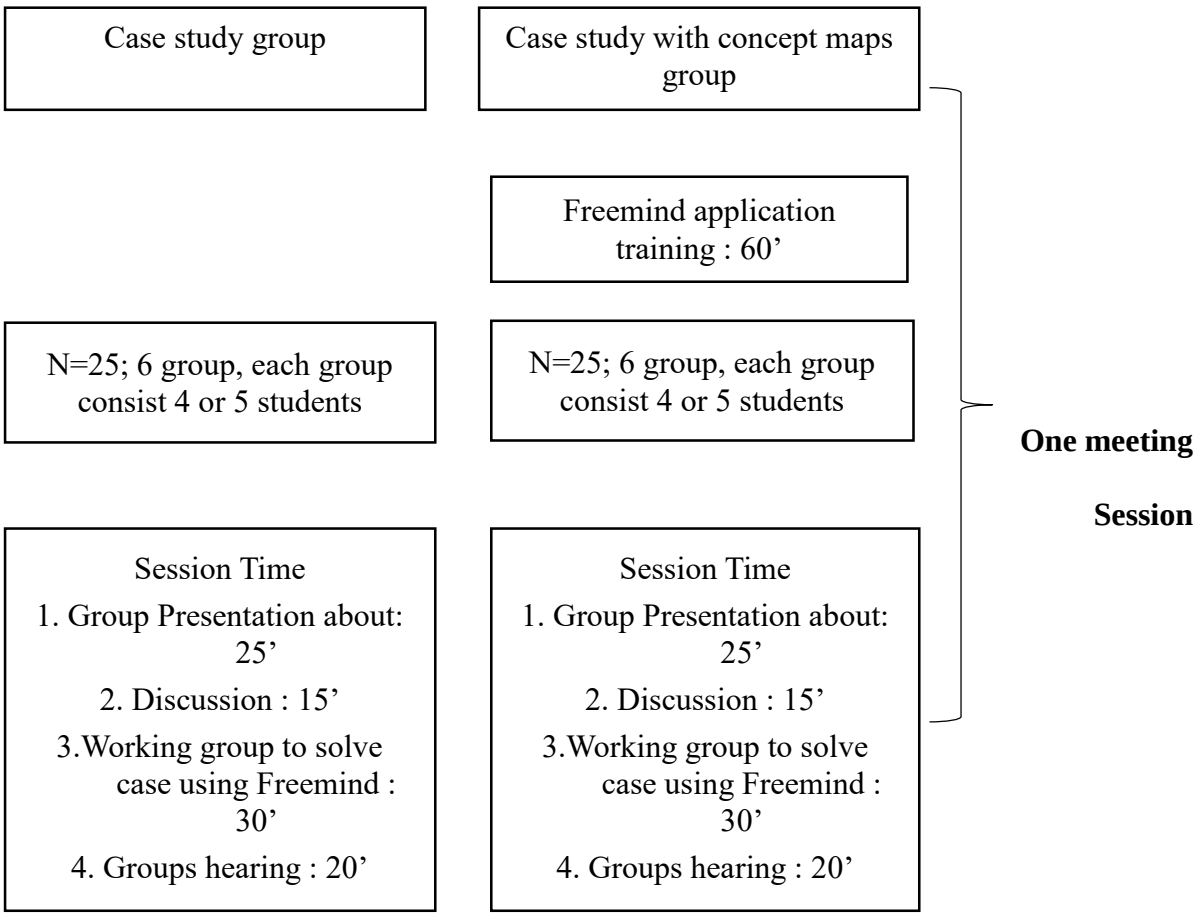


Figure 4.3 Outline of the Experimental Groups in a Meeting

4.1.3 Result of Experiment 1

a. Cornell Critical Thinking Level Z

In Experiment 1 CSCM group consists with 20 female and 5 male participants, with the average age is 18.4, the CS group consists with 17 female and 7 male with the average age is 18.28, and Control Group consists with 21 female and 4 male with the average age is 18.04. The means and standard deviations (SD) on each of the three group in pretest and posttest are presented in Table 4.1 for Cornell Critical Thinking Level. The mean and SD are described with the total number of students in the study N = 75, each group consists of 25 participants. Mean of Cornell Critical Thinking Level Z scores are provided in Table 4.1 below.

Table 4.1 Mean of Cornell Critical Thinking Level Z Pretest and Posttest Scores for Experiment 1

	Pretest		**Posttest**	
Cornell CT Level Z	**Mean**	**SD**	**Mean**	**SD**
Control Group	31.04	1.48	32.28	1.45
CS	30.68	1.43	32.12	1.48
CSCM	29.28	1.43	33.76	2.39

In pretest, the Control Group (M = 31.04) scored higher than CS (M = 30.68) and CSCM group (M = 29.28). Unlike in the pretest, the CSCM group showed improvement score of Cornell CT Level Z (M =33.76) compares to others. Meanwhile, even though CS also show some improvement, however, the increase is not really severe. Figure 4.4 describe visually the mean improvement of Cornell CT Level Z for each group in this study:

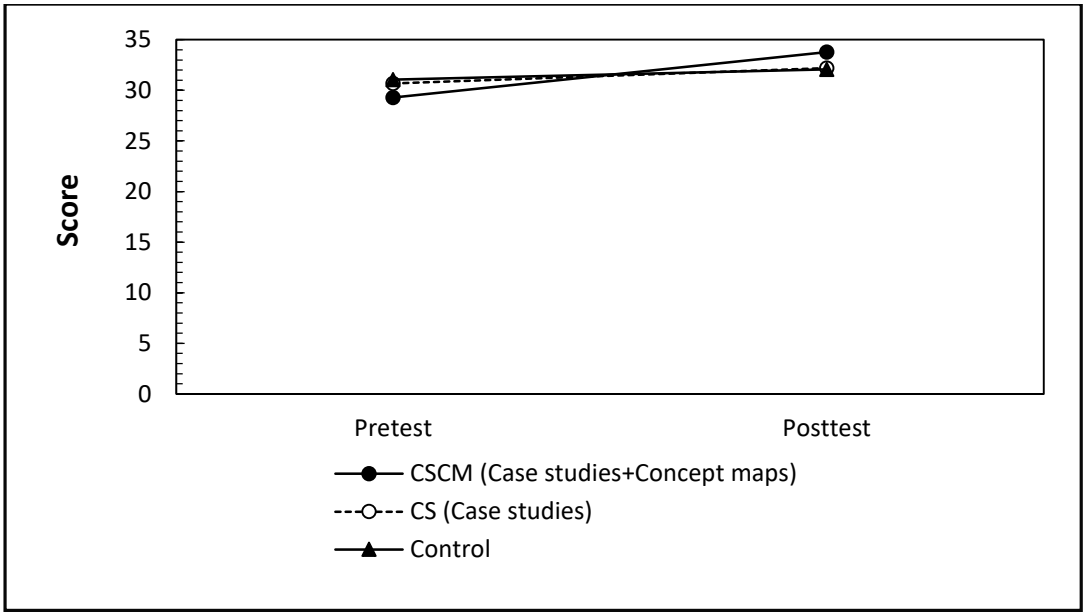


Figure 4.4 Mean Score of Cornell Critical Thinking Score in Experiment 1

The CSCM group showed the greatest improvement from pretest to post-test. ANOVA of Group (3)*Time (2) showed the significant interaction of Group*Time (F[2, 72]=17.93, p<.01). This means that there is a significant effect of method on improving critical thinking skills. In details, the group that used CSCM show the greatest improvement compare to others group.

Table 4.2 Analysis of Variance of Cornell CT Level Z for Experiment 1

	SS	**df**	**MS**	**F**	**P**
Group	1.693	2	0.85	0.252	
Error	242.2	72	3.36		
Test	213.6	1	213.6	92.940	.000
Group*Test	82.41	2	41.2	17.929	.000
error[BS(A)]	165.48	72	2.298		

Analysis of simple main effect on the significant interaction of Group*Time showed that there is a difference between groups in the pretest (F[2, 144]=7.634, p<.01) and posttest(F[2, 144=7.220, p<.01). In pretest, critical thinking skill score was significantly poorer for CSCM than CS and Control Groups (ps<.05), however the difference between CS and Control Groups was not significant (p>.05). By contrast, critical thinking skill score was significantly higher in CSCM group than in the CS and Control Groups (ps<.05), and the

difference between case studies and Control Groups was not significant (p>.05). Simple effect analysis also showed the improvements from pretest to posttest were significant for all the three groups (ps<.01).

Table 4.3 Analysis Simple Effect towards Cornell CT Level Z for Experiment 1

Effect	SS	Df	MS	F	P
Group (Pretest)	43.23	2	21.61	7.63	.0007***
Group (posttest)	40.88	2	20.44	7.22	.0001***
Error		144	2.83		
Test (CSCM)	250.88	1	250.88	109.16	.0000****
Test (CS)	25.92	1	25.92	11.29	.0013***
Test (CG)	19.22	1	19.22	8.36	.0051**
Error		72	2.29		

+ p<.10, * p<.05, ** p<.01, *** p<.005, **** p<.001

b. UF EMI

The means and standard deviations on each of the three group in pretest and posttest are presented in Table 4.4 for UF EMI test. This table is presented the total number of students in the study N = 75, each group consists of 25 participants. Mean of UF EMI is provided in Table 4.4 below.

Table 4.4 Mean of UF EMI Pretest and Posttest Scores for Experiment 1

Instrument	Pretest		Posttest	
UF EMI	Mean	SD	Mean	SD
Control Group	100.24	6.83	105.68	1.77
CS	102.76	9.27	107.07	2.57
CSCM	99.48	7.61	107.72	2.89

Table 4.4 contains a distribution of UF EMI scores between all groups in pretest and post-test. In pretest, mean scores for a Case studies (M= 102.76) were higher than Control Group (100.24) and CSCM group (107.72), meanwhile, for the posttest, the CSCM group show the highest improvement compare to others group. However, in total all group show improvement in the posttest. The UF EMI mean of each group show in figure below:

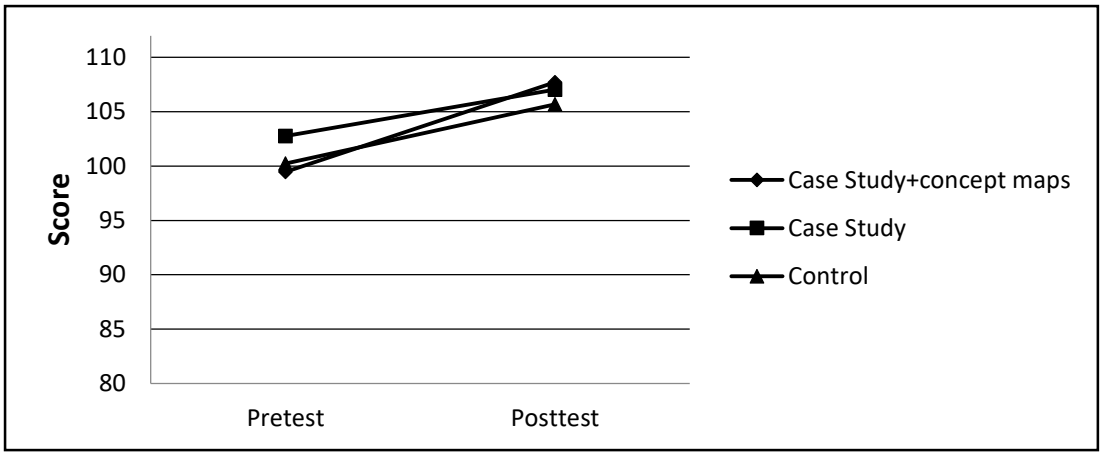


Figure 4.5 Mean Score of UF EMI on Experiment 1

Meanwhile ANOVA of Group (3)*Test (2) showed significant main effect of Test (F[1, 72]=43.47, p<.01). However, main effect of Group (F[2, 72]=1.26, p=.289) and interaction of Group*Test (F[2, 72]=1.68, p= .94) were not significant. These results suggests, although participating any types of learning activity might increase students' critical thinking disposition, active learning technique might not have any advantage on this purpose.

Table 4.5 Analysis of Variance of UF EMI on Experiment 1

	SS	Df	Mean Square	F	Sig.
Group	97.7200	2	48.860	1.262	.2892
Error	2786.92	72	38.707		
Test	1344.007	1	1344.007	43.474	.000
Test*group	103.613	2	51.807	1.676	.194
Error[BS(A)]	2225.880	72	30.915		

Based on the analysis there is an overall significant difference was found between UF EMI pretest and posttest (p<.01), however when it interacts with groups the result is not significant. The multiple comparisons also showed there is no significant difference between CSCM, CS, and Control Groups for UF EMI (p >.01).

Tabel 4.6 Multiple Comparisons of UF EMI between Groups for Experiment 1

(I)Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.
CSCM	CS	-1.30	1.244	.300
	CG	.640	1.244	.609
CS	CSCM	1.30	1.244	.300
	CG	1.940	1.244	.123
CG	CSCM	-.640	1.244	.609
	CS	-1.940	1.244	.123

4.1.4 Discussion of Experiment 1

As the conclusion for the Experiment 1, we found that case studies activity combined with a concept map application software were most effective on improving critical thinking skills in Indonesia college students. By contrast case studies alone (CS) had no effect compared to control condition in which traditional lecture with no active learning technique was given. This result is contrast with other studies that showed that case studies alone without concept map is effective on learning (e.g., Bayona & Castaneda, 2017) and research that conducted by Anggraeni (2012) which found case studies method improve the ability critical thinking of international relations students courses in Indonesian.

The CS group indicate almost similar increasing score as the Control Group. The case studies participants' scores result were not significantly higher compared to CSCM group for critical thinking skills. It might happened because the group was not have any training about how to make formulate the case and link theory to practice (Popil, 2011). Therefore, even though student given a case to analyses they do not fully understand how to solve the case. In the line, the participants in this study were first year student, therefore they might not so familiar with case studies method. In Indonesian education system even though student might have a chance to involve in a group discussion, however using case studies as method of learning is still rare, so even the CS group was given a task to solve a problem, the participants

might have confused about what step they should take. Furthermore, even the educational system in Indonesia reform to more modern approach to delivery information, however, in reality, the education system still heavily relies on memorizing texts. Meanwhile there also differences in thinking style and abilities, some participants may have good logical reasoning skills, but there also participants who found it difficult to solving the case. Therefore, providing only a case without guidance about how the case should be communicated and mapped to make it easier to understand might not really helpful to enhancing critical thinking skills. Case studies activity might be effective only if students have sufficient necessary skills for the activity.

Meanwhile, based on UF-EMI result the CSCM showed improvement from pretest to posttest. However, in general the CS and Control Group also showed improvement from pretest to posttest. This might cause of UF-EMI reflect not only improvement of critical thinking disposition but also social desirability. That is, students might have tendency to show themselves to be desirable against teachers. In the experimental setting, researcher assign the Cornell critical thinking test first and then UF-EMI, based on observation on setting students complained about the difficulty of Cornell Critical Thinking Level Z and not enough time to finished all the item. Based on this conditions, student might felt failed on Cornell Critical Thinking Level Z, this might drive students to think that they should filled the UF-EMI with good judgement, therefore it will fill the gap score of Cornell Critical Thinking Level Z. Even though researcher already warned students in the beginning that the Cornell Critical Thinking Level Z score and UF-EMI result not related to final score, some students might still think that the result of both test weigh on their final score.

As we describe in method of case studies activity, student is demand to solve a case where some active learning activities might involve like discussion, and shares ideas, collecting data, this activity might help to develop students critical thinking disposition, however it might be not enough to escalate critical thinking skills. Further examination is needed to clarify

underlying mechanisms and determinants of changes in UF-EMI. For Experiment 2, it is recommended to use objective measures to avoid social desirability bias.

Furthermore, it is important to assess the performance of each student activity performance when conducting activities related to case studies and concept mapping therefore the result will be more specific on how case studies can be contribute to an increase in critical thinking skills and disposition in each student. Therefore, in Experiment 2, we use Student Activity Observation sheet to assess fundamental and effective plan to monitor and evaluate student activity during learning process.

4.2 Experiment 2

4.2 Introduction to Experiment 2

Based on result of Experiment 1, we formulate the design of Experiment 2 which we still use the characteristics of the three group that involved in Experiment 1 and then add one group with preparatory training of case studies activity. As Mayo (2014) mentioned about the effectiveness instruction and basic knowledge of case studies on student ability to relate between theory and practice foster the critical thinking.

Experiment 1 found that case studies had no additional effect on improving critical thinking. We assummed the result might be due the lack of experience and knowledge about case studies activity among student. In that case, we thinking to give student some training of case studies activity to investigate the effect of preparatory training on critical thinking. Therefore purpose of the Experiment 2 is to examine whether preparatory training for case studies activity has effect on improving critical thinking skills. In Experiment 2 we involve 4 groups, which are case studies with concept maps (CSCM), case studies (CS), case studies with preparatory training (CS Training) and Control Group. The participants in this study were first-year students of a college, therefore it was expected that they were not so familiar with case studies activity since such active learning methods did not prevail in high schools in Indonesia. If lack of experience of case studies activity was a major reason of ineffectiveness of case studies in Experiment 1, it was expected that the group that had preparatory training with guidance about how the case should be solved would show greater improvement in critical thinking skills than the group that did not receive any previous training.

4.2.2 Method for Experiment 2

The purpose of the Experiment 2 is to examine whether the preparatory training improving critical thinking skills and dispositions. The design that use in this experiment is pre-test and post-test design with 4 groups, which are CSCM, CS, Control Group and case studies with preparatory training (CS Training) as the additional group. All the four group had same class objectives and contents in 8 meeting, the only difference is the educational strategy; the first group will use case studies combined with concept maps with 25 participants, the second group use preparatory training about case studies activity with 26 participants, the third group is intervention case studies with 38 participants the fourth group is Control Group, which only have the regular class with 26 participants. Each group filled the assessment for critical thinking skills (The Cornell Critical Thinking Level Z) and critical thinking disposition (University of Florida Engagement Cognitive Maturity and Innovativeness assessment (UF-EMI) for pretest and posttest. The student activity observation sheet also used to record student behaviors that significantly related to students' case studies activity or learning activity. The instrument consists of 10 observation items that are completed by the observer (another lecturer) based on the behaviors that students displayed during the class activity. The student observation sheet was given at each of the two meetings, it is expected that with this stipulation the student's behavior changes might be more obvious.

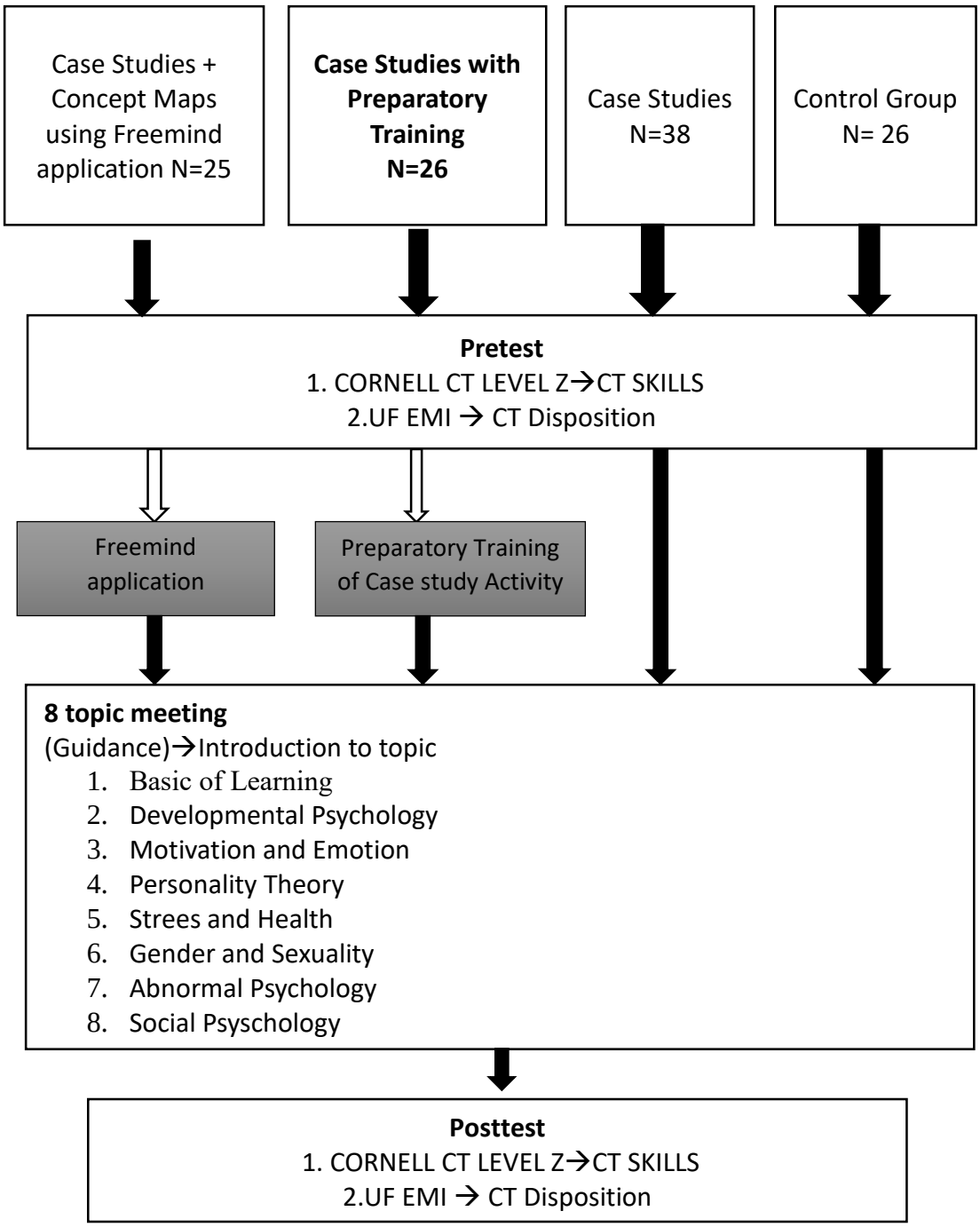


Figure 4.6 Design of Experiment 2

The treatment for a case studies with concept maps and preparatory training of case studies activity divided into several similar steps like mentioned in the Experiment 1. The difference is regarding training object in the first meeting, for a case studies with concept maps at the beginning, the student participates on Freemind application training which the purpose to encourage student knowledge and experience on how to manage the application and apply

it with a case. Meanwhile, Experiment 2 is advanced of the Experiment 1 that attempts to explore whether by giving an insight of into the steps in solving a case with preparatory training, which was not given to the Experiment 1 will have an impact on the critical thinking. Following the steps that we used to train student how to solve a case

a. Collecting multiple research studies or papers
b. Creating a clear statement of objectives to help student develop effective research questions by problem formulation.
c. Selecting, gathering and measuring information related to the case.
d. Treatment of data is essential in order to make use of the data in the right form. Raw data collection is only one aspect of an experiment; the organization of data is equally important so that appropriate conclusions can be drawn, by trying to classify data into commonly known patterns and mapping the data to produce meaningful information.
e. Reviews and analysis by critically analyze multiple research studies or papers and then finding and analyzing studies that relate to and answer case in a structured methodology.
f. Summarize how your results with a few sentences and use this summary to support your conclusion.

4.2.3 Result of Experiment 2

a. Cornell Critical Thinking Level Z

As explained before, the Experiment 2 is basically based on the Experiment 1 result. The Experiment 1 found that CSCM has higher improvement compared to another group (case studies and Control Group) for Cornell CT level Z, however, the case studies showed no significant improvement. Therefore, we add preparatory training of case studies to examine the effect on critical thinking. CSCM group consists with 23 female and 2 male participants, with the average age is 18.04, the CS group consists with 32 females and 6 males with the average

age is 17.76, CS Training consists with 19 females and 7 males with the average age is 17.7, and Control Group consists with 23 female and 3 male with the average age is 17 88. The means and standard deviations on each of four group in Experiment 2 (CSCM, a case studies with preparatory training, case studies and Control Group) for pretest and posttest instruments are presented in Table 4.7 for Cornell Critical Thinking Level. The data are presented for the total number of participants in the study N = 115.

Table 4.7 Mean of Cornell Critical Thinking Level Z Pretest and Post-test Score on Experiment 2

Instrument	**Pretest**		**Posttest**	
Cornell CT Level Z	**Mean**	**SD**	**Mean**	**SD**
Control Group	12.88	3.51	14.26	4.79
CS	12.58	3.48	20.44	4.03
CSCM	15.24	3.83	29.96	2.66
CS Training	16.34	5.64	24.57	1.96

Based on the mean score in pretest, the CS Training group show the higher score of Cornell Critical Thinking Level Z (M = 16.34) compared to others groups. However, for post-test, CSCM scored higher (M = 29. 96) compare to others three group. Meanwhile, even though control group also show some improvement, however, the increase is not really significant. In the other hand post test result show case studies improved critical thinking skills (M= 20.44) but CS Training had no additional effect (M= 24.57).

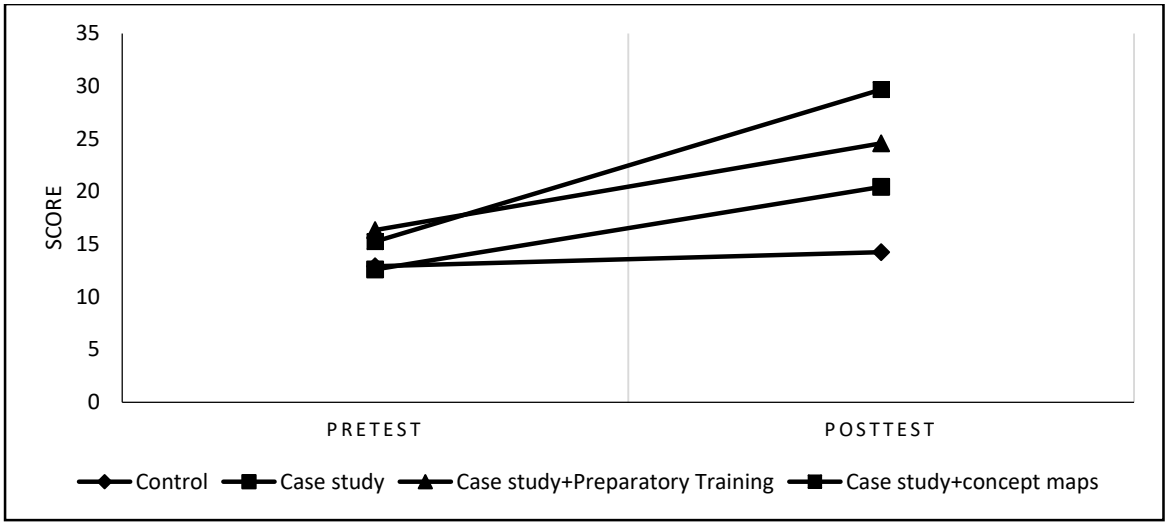


Figure 4.7 Mean of Cornel Critical Thinking Level Z for Experiment 2

Figure 4.7 shows mean total scores of the Cornell Critical Thinking Level Z in the pretest and posttest. CSCM group showed the greatest improvement from pretest to post test. Control Group showed no improvement. Although critical thinking skills score was significantly higher in CS Training group of case studies activity than only CS group in the posttest, there was also significant difference between these groups even in the pretest.

Table 4.8 Analysis of Variance of Cornell Critical Thinking Level Z for Experiment 2

	SS	Df	Mean Square	F	Sig.
Group	2717.805	3	905.935	50.151	.000
Error	2005.102	111	18.06		
Test	3620.125	1	3620.125	298.301	.000
Test * group	1134.385	3	378.128	31.158	.000
Error(time)	1347.076	111	12.136		

ANOVA of Group (4)*Test (2) showed significant main effects of Group (F[3, 111] =50.15, p<.01) and Test (F[1, 111] =298.30, p<.01), and significant interaction of Group*Test (F[3, 111] =34.12, p<.01). The analysis also found that there also a difference between pretest and posttest result (p<.01). Simple effect analysis showed improvements from the pretest to the post test were significant for CSCM, CS Training, case without preparatory training (ps<.01) but not for Control Group (p=.014).

However, there was significant simple main effect of Group in the pretest (p<.01) and in the posttest (p<.01). Therefore, we calculated "difference score" (posttest minus pretest) to compare degree of improvements among the groups. Analysis of variance of Group (4) for the difference score showed a significant main effect of Group (F[3, 111] =31.16, p<.01). Multiple comparison between the groups showed that improvement from the pretest to the posttest was significantly greater in CSCM group than in other three groups (ps<.05), significantly greater in CS training group and CS group than in control group (ps<.05), but was not significant between CS training group and case studies without preparatory training group (p>.05). These results confirmed the greatest effectiveness of CSCM treatment as shown in Experiment 1. Contradiction with our Experiment 1 CS also even was also effective to some extent enhance critical thinking skills. Even though we expecting preparatory training create case studies treatment more effective, however the result showed that this treatment had no additional effect on improving critical thinking skills.

Tabel 4.9 Comparison between Groups on Cornell CT Level Z for Experiment 2

(I) Treatment	(J) Treatme	Mean Difference (I-J)	Std. Error	Sig.[a]
CS	CS Training	-3.948*	.765	.000
	Control Group	2.936*	.765	.001
	CSCM	-6.087*	.774	.000
Case studies with Preparatory Training	CS	3.948*	.765	.000
	Control Group	6.885*	.834	.000
	CSCM	-2.138	.842	.075
Control Group	CS	-2.936*	.765	.001
	CS Training	-6.885*	.834	.000
	CSCM	-9.023*	.842	.000
CSCM	CS	6.087*	.774	.000
	CS Training	2.138	.842	.075
	Control Group	9.023*	.842	.000

b. UF EMI analysis

The means and standard deviations for each of the four group in pretest and posttest instruments are presented in table 4.10 for UF EMI. The data described with the total number of participants in the study N = 115.

Table 4. 10 Mean of UF EMI Pretest and Post-test Scores for Experiment 2

Instrument	Pretest		Posttest	
UF EMI	**Mean**	**SD**	**Mean**	**SD**
Control Group	94.88	8.84	95.15	8.21
CS	93.52	10.84	96.23	5.36
CSCM	93.48	11.32	102.08	5.89
CS Training	91.15	13.5	96.35	12.99

Table 4.10 contains a distribution of UF EMI scores between all groups in pretest and posttest. In pretest, mean scores for the Control Group (M= 94.88) were higher than CS (M = 93.52), a CS Training (M= 93.48) and CSCM group (93.48), meanwhile for the posttest CSCM group show the highest improvement compare to others group (M = 102.08). There also some increasing score with case studies with preparatory training (M = 96.35), unlike the Control Group which had no additional effect on critical thinking score.

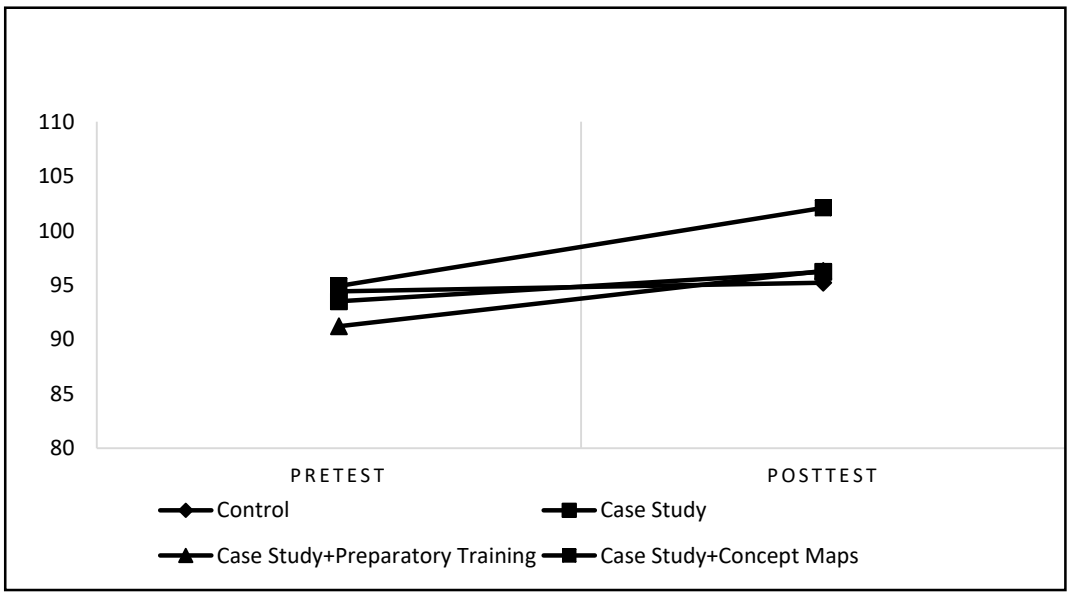


Figure 4.8 Mean of UF EMI for Experiment 2

ANOVA of Group (4)*Test (2) showed significant main effect of Group (F[3,111] =2.702, p<.05) and Test (F[1,111] =7.824, p<.01). However, interaction of Group*Test was not significant (F[3,111] =.938, p>.05). It was showen that overall disposition score improved from pretest to posttest significantly (p<.01).

Tabel 4.11 Analysis of Variance of UF EMI for Experiment 2

	SS	Df	Mean Square	F	Sig.
Group	716.51	3	238.84	2.702	.0049
Error[S(A)]	9810.34	111	88.38		
B: Test	875.12	1	875.12	7.824	.0061
Group*Test	335.18	3	111.73	0.999	.3963
Error [BS(A)]	12415.48	111	11.85		

Furthermore, since the effect of interaction between group and time show no significant effect and the multiple comparisons also showed there is no significant difference between CSCM, case studies, and Control Group for UF EMI (p >.05). Therefore, there was no significant effect of experimental treatments on improving critical thinking dispositions.

Tabel 4.12 Comparison between Groups for Experiment 2

(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.
CS	CS Training	1.13	1.69	1.00
	Control Group	0.09	1.69	1.00
	CSCM	-3.60	1.71	0.23
Case studies with Preparatory Troaining	CS	-1.13	1.69	1.00
	Control Group	-1.04	1.84	1.00
	CSCM	-4.73	1.86	0.08
Control Group	CS	-0.09	1.69	1.00
	CS Training	1.04	1.84	1.00
	CSCM	-3.69	1.86	0.30
CSCM	CS	3.60	1.71	0.23
	Case studies Training	4.73	1.86	0.08
	Control Group	3.69	1.86	0.30

As mentioned on Chapter 1, for the Experiment 2 "Student Activity Observation Sheet" forms were used for monitoring the student activity during the experiment. The researcher help by the additional rater to filled the observation sheet to check for student's activity in each group in every twice meeting. Based on the mean score on Time 1, the CS group show the higher score on student activity observation sheet (M = 34.50) compared to others groups. However, for Time 4, CSCM scored higher (M = 38. 72) compare to others three group. Similarly result at Time 4 for case studies show improvement (M= 36.66) as well as CS Training group (M = 36.92), furthermore for control group the mean score is fluctuate.

Table 4. 13 Mean of Student Activity Observation Sheet Scores for Experiment 2

	Grup	**Mean**	**Std. Deviation**
Time1	control group	33.27	4.00
	case studies	34.50	2.79
	case studies preparatory training	34.46	4.49
	CSCM	34.32	5.20
Time2	control group	34.35	3.96
	case studies	35.55	2.71
	case studies preparatory training	35.77	4.00
	CSCM	36.44	4.93
Time3	control group	33.38	3.45
	case studies	36.24	2.51
	case studies preparatory training	36.58	4.44
	CSCM	37.96	4.61
Time4	control group	34.12	4.08
	case studies	36.66	3.77
	case studies preparatory training	36.92	2.84
	CSCM	38.72	3.31

Based on the table, we found that case studies group has the higher score on Time 1, but after 8 meeting, CSCM group show the greatest improvement compare to others group. Similar results were also demonstrated by the case studies and case studies with training.

Meanwhile for control group, even though on Time 2 there is some improvement, however on Time 3 the score was a bit drop and slowly increase on Time 4

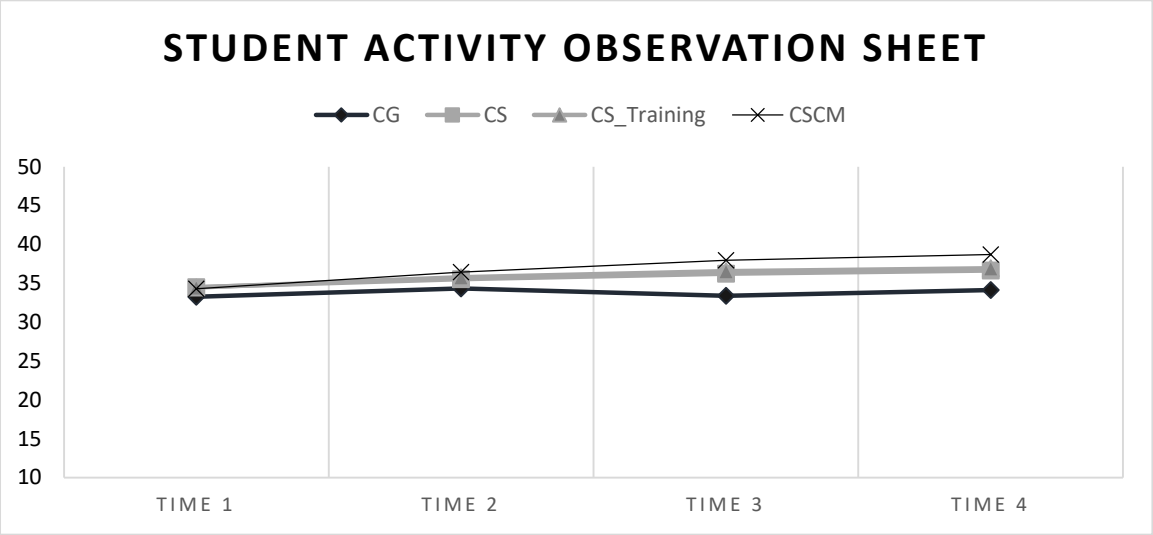


Figure 4.9 Student Activity Score

ANOVA of Group (4)*Test (2) showed significant main effect of Group (F[3,111] =5.08, p<.05) and Test (F[1,111] =25.47 p<.05). Furthermore interaction of Group*Test was significant (F[3,111] =2.70, p>.05). This means that there is a difference of student activity in each group that involved in this experiment study, where student activity is higher in the case studies combined with concept maps compare to others group.

Table 4.14 Analysis of Variance of Student Activity Sheet for Experiment 2

	SS	Df	Mean Square	F	Sig.
Group	517.90	3	172.64	5.08	.002
Error	3772.46	111	33.99		
Test	394.60	1	394.60	25.47	.000
Test * group	111.18	3	37.06	2.70	.049
Error(time)	1523.62	111	13.376		

4.2.4 Discussion of Experiment 2

Result of Experiment 2 support the result of Experiment 1 that found that case studies with concept maps was most effective on improving critical thinking skills. Meanwhile a contrast result was found for case studies group, if on Experiment 1 case studies had no additional effect on critical thinking skills, the opposite result was found on Experiment 2 where case studies had significant effect on critical thinking skills. Although case studies with preparatory training had significant effect, preparatory training had no additional effect on improving critical thinking skills. Case studies group in Experiment 1 show no improvement, might related to individual differences, some student might feel engage with case studies activity, while other student might feel not interesting to case studies activity. Thus, when this method is applied, some students who are not interested may not share ideas and engage in group discussions. Further explanation regarding the result will be explaining in next chapter.

Furthermore, for UF EMI result, we had almost similar result with the Experiment 1 result, which there is no significant effect of group. All groups showed improvement on UF EMI, we suspected that since the participants in this research were first year students and the topic of Introduction to Psychology was fresh and exciting for them, therefore even with lecturing class student might feel motivated and engage with the learning process. This might lead them to change their critical thinking *disposition*, however somehow it is not enough for pump their critical thinking *skills*.

Besides that, we also found hard to eliminate the social desirability among students. Instruments that we used in this research might be quite fragile, therefore some students might answer dishonestly in accordance with the actual conditions. Although, before filling out the instrument student has been reminded that the score does not affect their final score in the class, but it is possible that some students still considered it is important to show good scores on this

instruments. In contrast, Cornell Critical Thinking Level Z required depth thinking and analysis to solve a case, therefore student could not pretend to be critical thinker.

Meanwhile based on Student Activity Observation sheet, even on the first observation the Case studies group showed higher activity compared to others group, however on the end of the meeting Case studies with Concept Maps shown higher than others groups. By presenting content in the format of case while creating a concept maps involves students to making questions, promote group discussion, deep learning and skills to solving a problem. Case studies facilitate the development of critical thinking, learning, and particularly regarding the capacity to see an issue from various points of view and to bridge the gap between the practical applications of core course concept.

4.3. Interpreting effectiveness of Treatment Based on High and Low Critical Thinker.

Based on Experiment 1 and Experiment 2 analysis result we assumed that there is an influence of the initial score of critical thinking to the improvement of critical thinking skills and dispositions. In the Experiment 1, for Cornell Critical Thinking Level Z pretest mean for all groups is high (M = 30.33), while for Experiment 2 the mean for all groups in pretest is quite low (M = 14.08).

Therefore, based on this result, we develop the effect of a CSCM, CS and CS Training toward the initial high and low critical thinkers in each group. Table 4.13 describes the category of high critical thinkers and low critical thinker in each group based on Cornell CT Level Z score. Since, average score of Cornell Critical Thinking Level Z was 14.08, then we categorize subject who showed score lower than 14 as initial low critical thinker and subject showed higher than 14 as high critical thinker in the pretest.

Table 4.15 Category of high skill critical thinkers and low skill critical thinker in each group based on Cornell CT Level Z

Group	Category	Pretest	Posttest	N
CSCM	High	18.00	30.29	14
	Low	11.73	29.55	11
CS Training	High	19.56	24.56	18
	Low	9.13	24.63	8
CS	High	16.31	20.77	13
	Low	10.64	20.28	25
Control	High	17.14	17.86	7
	Low	11.32	12.95	11

As the result, Figure 4.10 shows for the initial low critical thinkers, the CSCM, CS Training and CS treatment has a positive contribution on improving critical thinking skills, unlike the Control Group that received a lecture-based learning had no effect on improving critical thinking skills. Meanwhile, for the initial high skill critical thinker, CSCM also have a significant effect on improving critical thinking skills. Futhermore, for the initial high critical

thinkers, although a CS Training and CS helps maintaining critical thinking skills, however, the degree of improvement is not really significant. In contrast, for the initial high skill critical thinkers in Control Group, the lecture class seems not to be effective in improving critical thinking skills.

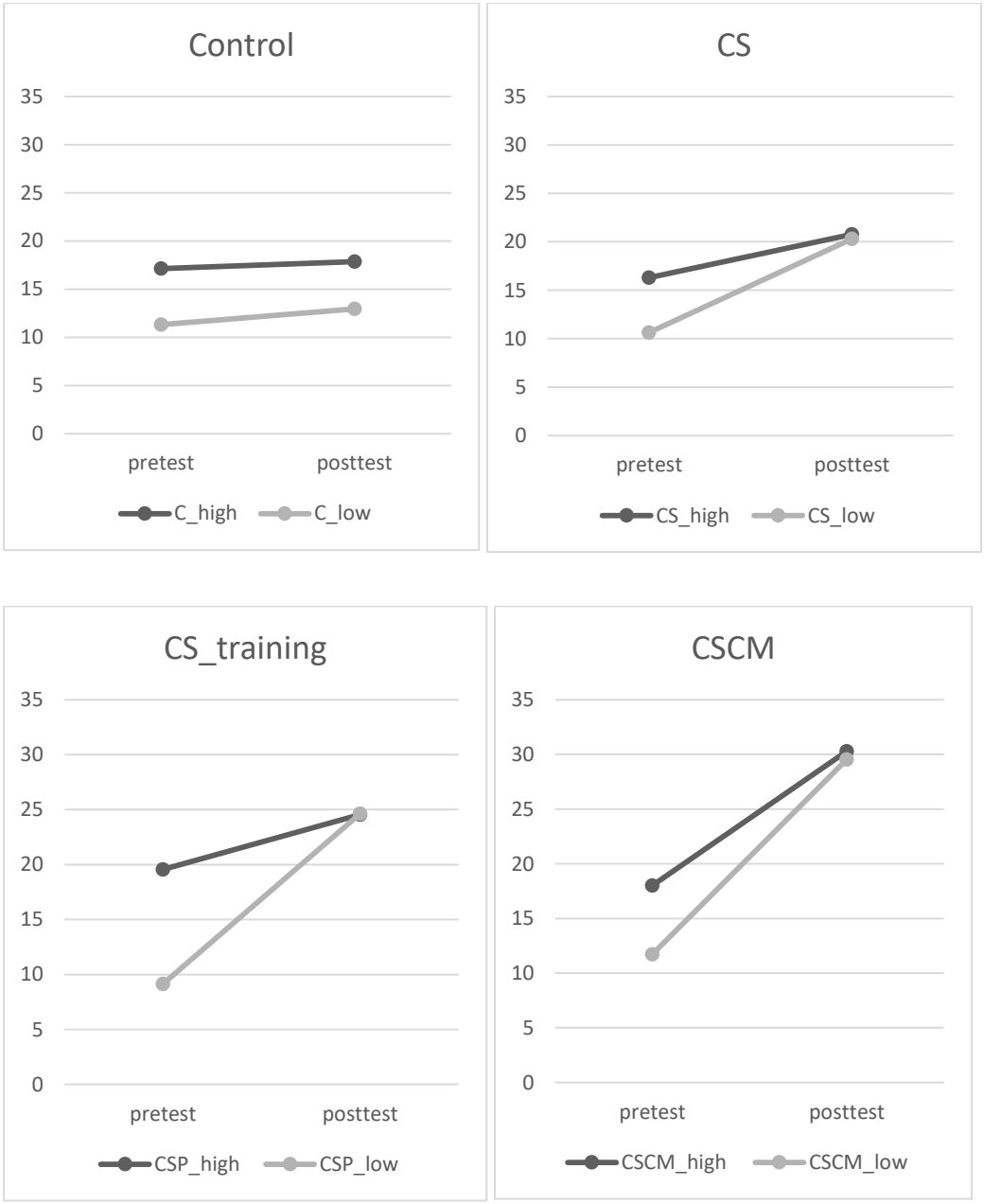


Figure 4.10 The effect of CSCM, CS and CS preparatory Training based on Critical Thinking Skills High-Low Category

ANOVA of Group (4)*Initial critical thinking level (2) was conducted for "difference score" of Cornell CT Level Z score (posttest minus pretest). Main effects of Group (F[3, 99] =54.323, p<.01) and initial critical thinking level (F[1, 99] =43.607, p<.01) is significant. Meanwhile, the interaction of Group*Initial critical thinking level (F[3, 99] =6.746, p<.01) were significant.

Table 4.16 Anova of Difference Score of Cornell CT Level Z score

	SS	**Df**	**MS**	**F**	**P**
A: Group	2468.952	3	822.984	54.323	.0000
B: CT level	660.636	1	660.636	46.607	.0000
AB	306.589	3	102.196	6.746	.0003
Error[WC]	1499.821	99	15.149		

Post hoc analysis on the significant main effect of group showed that improvement from the pretest to the posttest was larger in CSCM group than in the other three groups, larger in CS with preparatory training than in CS and Control Groups, and larger in CS group than in Control Group (ps<.05). Significant main effect of initial critical thinking skills level represents that improvement from the pretest to the posttest was larger in the initial low critical thinker than in the initial high critical thinker. Simple main effect of initial critical thinking skills level showed that improvement from the pretest to the posttest was larger in the initial low critical thinker than in the initial high critical thinker for CSCM, CS with preparatory training, and CS groups (ps<.01) but such difference was not significant for Control Group. Simple main effect of Group was significant for both initial high and low critical thinkers (ps<.01). For the initial high critical thinking skills, CSCM group showed significantly greater improvement than the other three groups (ps<.05), but differences among CS with preparatory training, CS, and Control were not significant. For the initial low critical thinking skills, improvement was significantly lower in Control Group than in the other three groups (ps<.05). CSCM and CS with preparatory training groups showed significantly greater improvement than CS and

Control Groups (*p*s<.05), but differences between CSCM and CS with preparatory training groups was not significant.

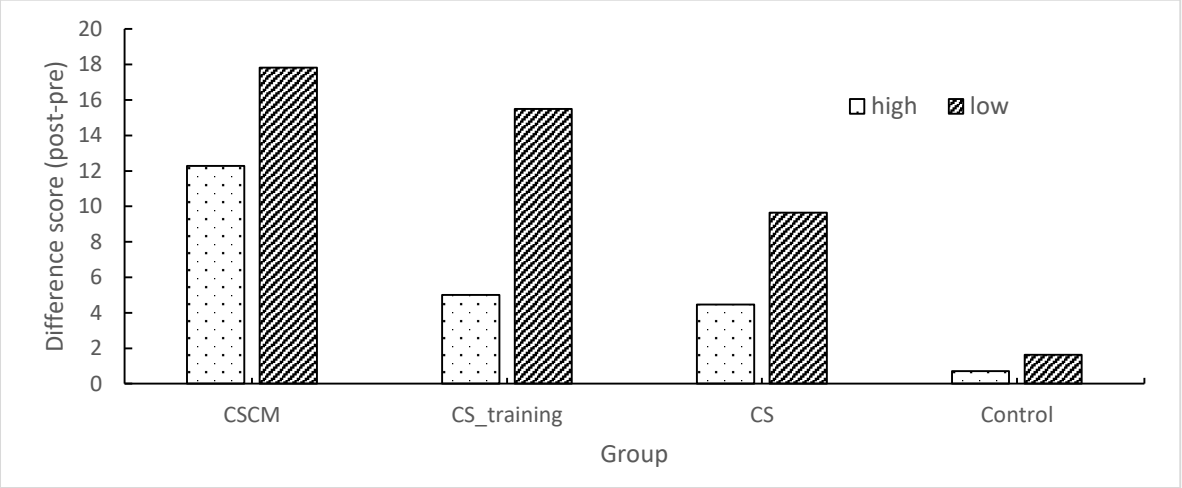


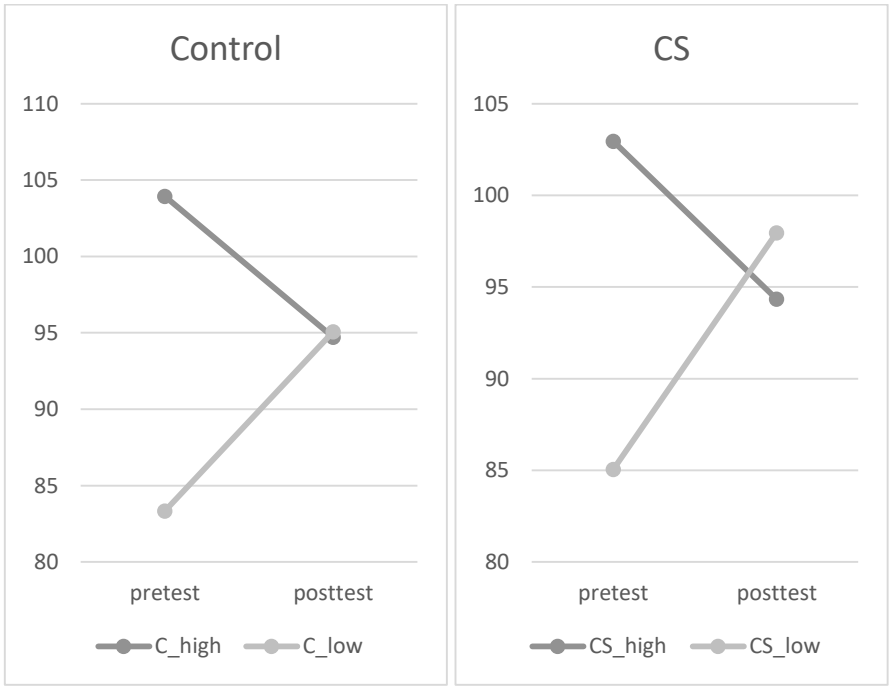
Figure 4.11 Difference Score of Cornell CT Level Z score

Meanwhile, for the Experiment 1, the mean for all groups showed UF EMI score in pretest is high (M= 100.82) and for the Experiment 2 is more low (M= 93. 48). Since, average score of UF EMI was 93.48, we categorize subject who showed score lower than 93 as initial low critical disposition and subject showed higher than 93 as high critical disposition in the pretest. Furthermore, for UF EMI, this research also try to categorize the critical thinking disposition based on the initial high and low. Table 4.14 describes the mean of each category in each group that involved in this research based on UF EMI score.

Table 4.17 Category of high disposition critical thinkers and low disposition critical thinker in each group based on UF EMI

Group	Category	Pretest	Posttest	N
CSCM	High	100.8	103.4	15
	Low	86.0	100.1	10
CS Preparatory training	High	105.5	92.1	11
	Low	80.7	99.5	15
CS	High	102.9	94.3	18
	Low	85.1	98.0	20
Control	High	103.9	94.7	14
	Low	83.3	95.1	12

As the result, Figure 4.12 (see also Figure 4.13) shows for students of the initial low critical disposition, case studies with concept maps, a case studies with preparatory training, only case studies, and lecture class (control) group has a positive contribution on improving critical thinking disposition. Meanwhile, for students of the initial high critical thinking disposition, a case studies with concept maps also have a positive effect on maintaining the critical thinking dispositions. However, critical thinking disposition was decreased for the students of the initial high critical thinking disposition in a case studies with preparatory training, case studies, and lecture class (Control) group. The results for the critical thinking disposition suggest that receiving college lecture itself was effective to improve critical thinking disposition for students of initial low critical thinking disposition. Meanwhile, for the students of initial high critical thinking disposition could not maintain their critical thinking disposition if they did not receive the most sophisticated active learning method like CSCM.



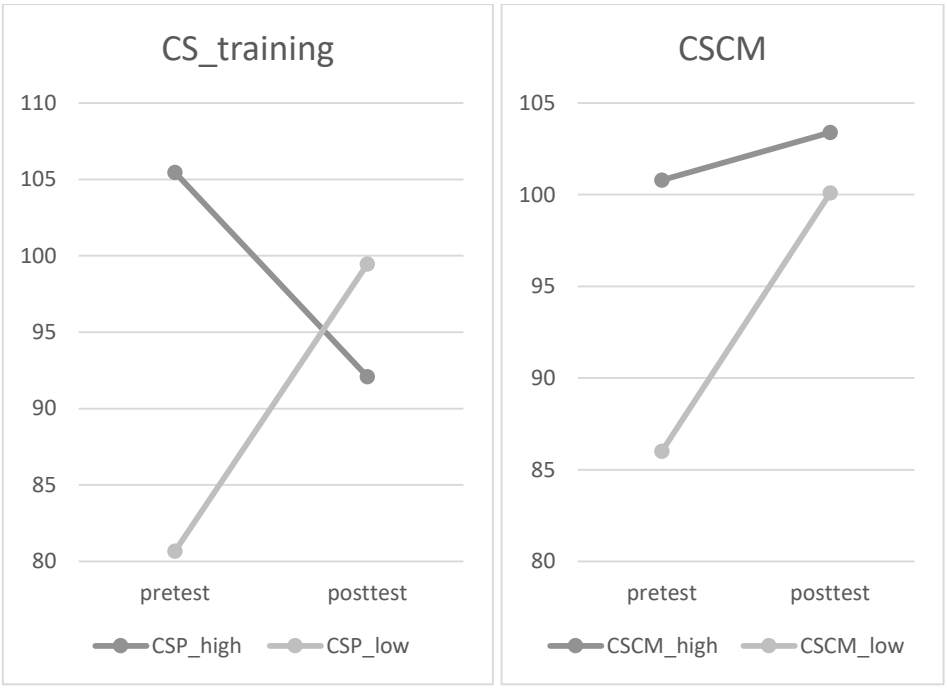


Figure 4.12 Effect of CSCM and CS preparatory Training based on Critical Thinking Disposition High-Low Category

ANOVA of Group (4)* Initial critical thinking disposition level (2) *test (2) was conducted for UF EMI score. Interaction of Group*Initial critical thinking disposition (F[3, 107] =5.167, p=.0023) was significant. Simple interaction was significant for CSCM (F[1, 107] =9.598, p=.0025), CS with preparatory training (F[1, 107] =75.079, p=.0000), CS (F[1, 107] =33.582, p=.0000), and Control groups (F[1, 107] =33.696, p=.0000).

Table 4.18 Anova of Difference Score of UF EMI score

	SS	**Df**	**MS**	**F**	**P**
A: Group	370.91	3	123.63	2.34	.0775
B: Initial CT level	4123.53	1	4123.53	78.46	.0000
AB	52.21	3	17.40	0.329	.8041
Error[S(AB)]	5653.29	107	52.83		
C:Test	746.6	1	746.6	15.837	.0001
AC	404.92	3	134.97	2.86	.0402
BC	6432.84	1	6432.84	136.45	.0000
ABC	730.75	3	243.58	5.16	.0023
Error [CS (AB)]	5044.27	107	47.142		

Simple simple main effect anaysis showed that critical thinking disposition score was significantly increased for students of initial low critical thinking dispositions in all the four groups (p<.01). Oppositely, students of initial high critical thinking dispositions in CS with preparatory training, CS, and Control groups significantly decreased their scores (p<.01). By contrast, scores between pretest and posttest in students of initial high critical thinking dispositions in CSCM group did not differ significantly (p=.3241).

For students of the initial high critical thinking disposition, CS with preparatory training, CS, and control group treatment was significantly decrease critical thinking disposition. By contrast, CSCM treatment was shown to be effective to maintain critical thinking disposition even for the students of initial high critical thinking disposition.

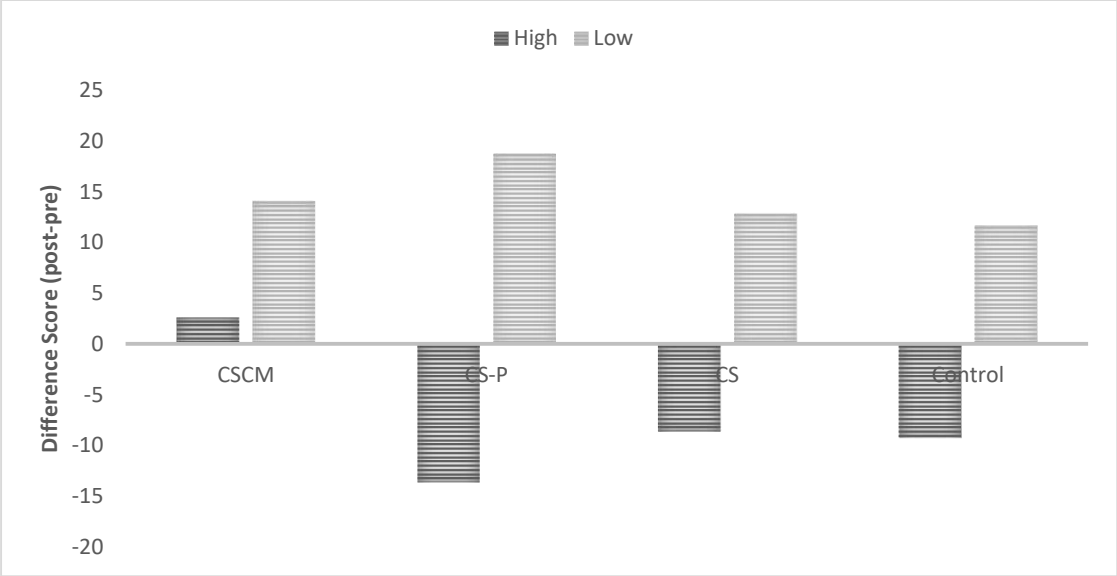


Figure 4.13 Difference Score of Cornell CT Level Z score

Summary of Results

The fourth chapter presented the statistical results for two instruments based on the Experiment 1 and Experiment 2. Cornell Critical Thinking Level Z, University of Florida Engagement Maturity and Innovativeness (UF-EMI), and Student Activity Observation Sheet. The result confirm the effectiveness of case studies with concept maps on improving critical thinking skills. Meanwhile a contrast result was found for case studies group, if on Experiment 1 case studies had no additional effect on critical thinking skills, the opposite result was found on Experiment 2 where case studies had significant effect on critical thinking skills. Although case studies with preparatory training had significant effect, preparatory training had no additional effect on improving critical thinking skills

For the initial high critical thinking skills, CSCM group showed significantly greater improvement than the other three groups. Meanwhile for the initial low critical thinking skills, CSCM, CS with preparatory training and CS group showed improvement after the treatment. Furthermore, for students of the initial high critical thinking disposition, CS with preparatory training, CS, and control group treatment was significantly decrease critical thinking disposition. By contrast, CSCM treatment was shown to be effective to maintain critical thinking disposition even for the students of initial high critical thinking disposition.

CHAPTER 5

GENERAL DISCUSSION

The main focus of this study is how higher education helps students through learning activity on develop their critical thinking abilities. Regardless of across the board concerns in developing students' abilities especially the higher thinking ability, however the reality both educational reformers and practitioner agreed that the ability to think critically is not maximally taught to students. Therefore to increase the breadth of the literature and increase awareness of the importance of critical thinking skills taught this study conducted. The purpose of this study was to examine the effectiveness of using a case studies together with concept maps and a case studies with preparatory training on improving critical thinking skills and dispositions among first year undergraduate students. To address the issue of the effectiveness of the type of case studies used for developing essential critical thinking skills and disposition, this research intended to answer the following:

1. Will a group of students presented with a case studies combined with concept maps who receive training in using the FreeMind application model perform better on the Cornell Critical Thinking Level Z test compared to those presented with a case studies alone and the Control Group?
2. Will a group of a students presented with a case studies with combined with concept maps who receive training in using the FreeMind application model perform better on the University of Florida Engagement, Maturity and Innovativeness (UF-EMI) test compared to students presented with a case studies alone and the Control Group?
3. Will a group of students presented with a case studies analyses better on a test that requires them to analyze the Cornell Critical Thinking Level Z test?

4. Will a group of students presented with a case studies analyses better on the University of Florida Engagement, Maturity and Innovativeness (UF-EMI) test compared to the Control Group?
5. Will a group of students presented with a case studies in combination with concept maps who receive FreeMind application model, perform better on Cornell Critical Thinking Level Z test compared to students that are presented with a case studies and prior preparatory training, the case studies alone and the Control Group?
6. Will a group of students who receive preparatory training prior to analyzing a case perform better on Cornell Critical Thinking Level Z test compared with students presented with a case studies alone and the Control Group?
7. Will a group of student who receive preparatory training to analyzing a case that requiring critical thinking differ in performance on the Engagement, Maturity and Innovativeness (UF-EMI) test compared to students that use the case studies only and the Control Group?
8. Will a group of students presented with a case studies in combination with concept maps perform better engagement and perform in learning activity compares to others group on Student Activity Observation Sheet?

5.1 Discussion of Research Questions

Research question one and five are similar, therefore we will explain these results first in this section. These research questions examined the effect of a case studies in combination with concept maps (CSCM) for students who received explicit training using the FreeMind application. The test criteria was whether students performed better on the Cornell Critical Thinking Level Z compared to other groups. After a period of certain weeks, students in the experimental group were taught to apply the case studies with concept map to solve a

case with the help of the application of FreeMind. Students were given several assignments and multiple chances to use the FreeMind application. Meanwhile, for the case studies (CS) group, students also had similar activities in each meeting, the difference is the CS group did not have any kind of training before the class started and they did not use any application to help them to solve the case. Furthermore, for the Control Group, we do not give any special treatment, only a regular lecturing class.

Based on an analysis of the mean scores the CSCM group performed significantly poorer than the CS group and Control Group in the pretest but the CSCM group performed significantly better than CS group and Control Group in the post-test. Similar results were also found for Experiment 2, based on the mean score in the pretest, the case studies with preparatory training group had the higher score on the Cornell CT Level Z test compared to other groups. However, for the post-test, the CSCM scored higher compared to the other three groups. Using ANOVA to test for interactive effects, Group (4)*Test (2) showed there was a significant interaction of group and treatment.

This finding supports previous research by Huang et al. (2012) who found that case studies combined with concept maps were more effective than case studies alone at improving critical thinking skills as measured by the California Critical Thinking Skill Test (CCTST) scores. Huang et al. (2012) employed a 16-week teaching program, which the CSCM participants demonstrated critical thinking abilities to assess the credibility and relationships between, statements and to provide reasoning according to evidence and using deduction. In research published by Hicks-Moore (2005) describe concept maps encourage students to share and compare understanding of the variations and similarities matter, furthermore classmates also can provide valuable feedback on prepared concept maps and revise the concept maps.

We suspected that concept mapping can help develop the ability to see problems in the mind's eye, also sharing feedback towards others student that sharpen the critical thinking

ability of students. By developing case studies with concept maps there is an emphasis on innovative thinking to help student make a visual scheme to solve the cases. Akinsanya & Williams (2004) mentioned concept mapping as a challenging learning experience as it takes into account the integrity and logicality of the thinking process, however this method of learning was able facilitate critical and creative thinking skills. Concept mapping include activity, where students interpret, analyze and evaluate their logical flow of thought about the themes, in their own logic that can occur in usual way (Harpaz, Balik & Ehrenfelld, 2004).

According to Hay, Kinchin & Lygo-Baker (2008) concept-mapping method as essential tool for enhancing teaching quality, this method involves four important components that can improve students' understanding in the learning process.

1. Identification of prior knowledge (and prior-knowledge structure). Prior knowledge is the baseline from which learning can be calculated and its quality assessed or the quality of students' learning will be determined in large part by their starting positions (Hay, et al, 2008). It is essential to know in advance students' understanding of a material. Teacher need to know the limits of student understanding and what material needs to be developed. Teachers can ask students to fill note about what they know on the material, or the teacher can provide multiple choice questions to measure student knowledge before the class meeting start. Understanding student limitation and misconception on material will help teacher arrange the material that suits students' needs and curriculum.
2. The presentation of new material in ways should facilitate meaningful learning (Hay et al., 2008). Hay (2007) research found that concept mapping has considerable utility for tracking change in the course of learning, and has the capacity to distinguish between changes that are meaningful, and those that are not. Furthermore, meaningful learning is defined by three traits: learner has prior knowledge that is relevant to the new learning,

learnt is presented in ways that have meaning and learner must choose to learn meaningfully. In Hay (2007) simple criteria of one subject matter were developed a priori to distinguish deep, surface and non-learning, where deep learning define as meaningful learning.

3. To sharing of 'expert' knowledge and understanding among teachers and learners; To assess this, teachers create map about their understandings of a topic, where students map the same topic as their teachers, comparing their maps can help to show the ways in which students can (or cannot) construct meaning from the new material they encounter (Hay, 2007)
4. Documentation of learning change to indicate integration of student prior knowledge and with new learning materials. To measure this component, we can use the results of the final test, which measures the extent to which students master learning after the learning method is applied.

Meanwhile, based on the current research result we formulated three hypotheses regarding the mechanism of case studies combined with concept maps benefit to improve critical thinking skills.

1. Students have different learning styles, which refers to learners of all ages have different yet consistent ways of responding in learning situations (Fleming & Mills, 1992). Oral discussion might benefit especially for student of auditory learning style, because they could share their ideas from auditory information. However, oral discussion might not be so effective for student of visual learning style. Introducing concept maps could visualize the content of oral discussion. Thus, student of visual learning style might improve their knowledge and thinking ability by utilizing and analyzing the concept map. To assess this hypothesis in further examination, before start the experiment we need to give an assessment to classify the learning styles of

students. Then we will compare the case studies only group and case studies combined with concept maps. The hypothesis predicts that in case studies only group, the student of visual learning style do not improve their critical thinking skills compare to student of auditory learning style. Whereas, the case studies combined with concept maps group, critical thinking skills will improve in student of visual learning style as well as student of auditory leaning style.

2. Oral discussion might contribute positively to improve critical thinking skills for high critical thinker, because high critical thinker could understand the content of discussion and share their ideas. However, oral discussion might not give benefit to student with low critical thinking skills because for low critical thinker might be difficult to understand what was discussed in oral discussion. Concept maps might help students of low critical thinker ability to understand the content of discussion. Therefore, case studies with concept maps was more effective than case studies alone. Therefore, student with high critical thinking as well as the low critical thinking might increase their critical thinking. Yet, this hypothesis contradicts with our current results of Experiment 2, which the case studies is able to improve critical thinking skills in students with low levels of critical thinking skill, in contrast case studies not improve critical thinking skills of high critical thinker. Therefore, this hypothesis is not supported by our findings.
3. The concept maps helps information sharing process. When students are given a case for discussion, through discussion section high critical thinker involve giving some ideas. However, such ideas might be at relatively normative or ordinary level, which such normative ideas might help to improve critical thinking skills in low critical thinker. However, just discussing might not lead to innovative higher level ideas. Thus, high critical thinker might not able to improve their critical thinking skills by case

studies alone. When the case studies combined with the concept maps, it might be able to activate students with high critical thinking skills to encourage them to provide innovative and clear reasoning that arrange in concept maps. This activity encourage high critical thinker to improve their critical thinking skills, as well as students with low critical thinker skills. To test this hypothesis, it can be done by forming two groups, where each group consists of mix students with high and low critical thinking skills. The first group is a group with a case studies and the second group is a case studies combined concept maps. Then, we will record each group's discussion during their discussion of a case to analyze, the depth and innovative value of this discussion. This hypothesis predict case studies combined with concept maps group will show the deeper and more innovative discussion than case studies alone.

As an effective learning tools, case studies combined with concept maps help students to link new information to their existing conceptual framework to construct new, meaningful knowledge as well as bridge relation theory and practice. If a student knew how buildings simple robot using blocks, it would be easy for them to combine more complex geometric shapes to make more difficult shapes. At the point when new learning is coordinated and associated with existing information is easier to understand and to remember. The instructor's activity is to build a learning framework from existing learning which to relate with new knowledge, which help student to have meaningful learning. The existence, contents, and organization of the learner's existing knowledge structure are crucial to the process of meaningful learning. If the new content is learned using this technique, it is less vulnerable to being forgotten and it will be easier to retain (Romance & Vitale, 2013).

As an example, in one of the case studies students were asked to identify the case that related to LGBT case. In Indonesia LGBT issues are a taboo subject and not really accepted by society. Some people believe that if Indonesian society was more open to the LGBT movement

it would cause an increasing number of LGBT identifying people because it is assumed that LGBT behaviors might be learn by imitation with the contact group. By implementing the case studies with concept maps, students first identified their stance on the LGBT case. Using concept maps, students were allowed to brainstorm and listed factors (attitudes, cause, and effect) that relate to a case. Students were able to use branching to create more unpredictable affiliations. After create their cognitive maps, students distinguished where their states of mind, convictions, and data originated from (previous knowledge, book, theories, experience, family, media, teachers, peers, political party, etc) and were able to integrate data to draw conclusions. Students found it important to investigate their own thinking in this way. Student additionally discovered that they could recognize assumptions in their thinking, to see that large number of their perspectives were essentially on reproductions of what they heard or read from other sources, to see that their views were not systematically or rationally acquired, as well as to assess the influence of various socialization that involving on their thinking. This process will help student enhancing their knowledge and when they need it will easily to recall, compare to only lecturing method of learning.

A concept map is one way to construct and connect knowledge. This means that the elements of knowledge become increasingly interconnected as expertise in a domain grows through learning, training, and/or experience. The treatment for a case studies with concept maps was divided into several steps that allow students to develop knowledge and meaningful experiences. As mentioned before, the instructor gave a case to the students to solve. Then students briefly discussed the case in the group to tackle the problem by listing related information and questions regarding the case. Students used the FreeMind application to help them visualize and organize the information, themes or their relationships in a visual fashion in order to help students focus on the problems relating to the cases. According to Novak & Canas (2006), concepts maps, usually enclosed in circles or boxes of some type, and

relationships between concepts indicated by a connecting line linking two concepts. The advantage of applying concept maps is that students can represent or revise the relationships in a diagram, in return students are more likely to understand those relationships, remember them, and be able to analyses the component parts. Concept mapping is powerful tools for the facilitation of meaningful learning is that it serves as a kind of template or scaffold to help to organize knowledge and to structure it, even though the structure must be built up piece by piece with small units of interacting concept and propositional frameworks (Novak & Canas, 2006).

Maps utilize the brain the associated with visual imagery, which enables processing data and idea to be used, then leading to a greater capacity for learning. This process requires more active engagement and practice, without practice this technique would not much improve critical thinking. (Twardy, 2004). As a teaching strategy, concept maps helps learning material conceptually clear and presented with language and examples relatable to the learner's prior knowledge (Novak & Canvas, 2006). Daley, Shaw, Balistrieri, Glasenapp, and Placentine (1999) demonstrated critical-thinking ability can change over the course of a semester due correct learning strategies, additionally, concept maps served both as an education method and evaluation strategy in this study. Similar results were found in concept mapping assessment reflects expected differences and change in the conceptual framework of critical thinking (West, Pomeroy, Park, Gerstenberger, & Jonathan, 2000).

The use of concept maps divide as education and application tools for nursing students (Toofany, 2008). For education purpose, it can be used in organizing, categorizing, analyzing, and evaluating data to arrange for learning tasks create a logical meaning that can be related to the student's cognitive structure. The student's cognitive structure must contain relevant ideas to which the new material can be anchored or connected. Concepts are powerful strategies for the meaningful construction of knowledge. According to cognitive researchers our mind is an

active and interconnected processor of information that we receive on our daily basis. Throughout the mapping process, student then apply or demonstrate complex relationships among various concepts and their sub-concepts, concept maps are a practical way to take notes, review for exams, solve problems, make decisions, and develop and document plans of action (Gul & Boman, 2006), such activity enhances critical thinking skills.

Research question two was intended to examine the effect on a group students presented with a case studies in combination with concept maps who received explicit training in using FreeMind. The test criteria were their performance on the University of Florida Engagement, Maturity and Innovativeness (UF-EMI) test compares with the case studies and Control Group. In the pretest, the mean score for the case studies group ($M = 102.76$, $SD = 9.27$) was higher than the Control Group ($M = 100.24$, $SD = 6.83$) and the CSCM group ($M = 107.72$, $SD = 7.61$). For the post-test assesment, the CSCM group showed the largest improvement compared to the others groups. However, in total all groups showed some improvement in the pos-ttest assesment.

An analysis of the mean scores also showed that even the CSCM group performed significantly better than the CS group and the Control Group in the post-test, however, the CS group and the Control Group also showed significant improvement in the post-test compared to pre-test. However, an overall significant difference was found between the UF EMI pretest and posttest ($p < 0.01$), however when including interactions with groups the result was not significant. Multiple comparisons also showed that there was no significant difference between CSCM, case studies, and Control Group for UF EMI ($p > 0.01$)

The mean analyses suggested that case studies with concept map users had significantly higher critical thinking and affective dispositions compared with other methods. However, there was no significant effect between the three groups involved in this comparison. This might cause of UF-EMI reflect not only improvement of critical thinking disposition but also

social desirability. That is, students might have tendency to show themselves to be desirable against teachers. The other possibility factors is in the experimental setting, researcher assign the Cornell critical thinking test first and then UF-EMI, based on observation on setting students complained about the difficulty of Cornell Critical Thinking Level Z and not enough time to finished all the item. Based on this conditions, student might felt failed on Cornell Critical Thinking Level Z, this might drive students to think that they should filled the UF-EMI with good judgement, therefore it will fill the gap score of Cornell Critical Thinking Level Z. Even though researcher already warned students in the beginning that the Cornell Critical Thinking Level Z score and UF-EMI result not related to final score, some students might still think that the result of both test weigh on their final score.

The others factor due the implementation of the educational interventions is in one institution and at the same time, it was impossible to perform blinding of the learners. Participants allocated in different class might discuss their lecture after class, especially as the assessment that we used to measure critical thinking disposition was quite easy to memorize, and since the instrument using questionnaire responses from participants there is a possibility that some students sharing information's and instruments outside of class that increase the probability of student filled the statement with social desirability.

Research question three was intended to investigate the effect of case studies methods on the Cornell Critical Thinking Level Z test compared to the Control Group. Based on the result of Experiment 1 even though case studies participants showed some improvement, the effect size was small and improvement was modest. For the pretest (M = 30.68, SD =1.43) while in posttest (M=32.12, SD = 1.48). This data shows that there was no significant difference between the case studies group and the Control Group. A contrasting result was found for the case studies group in Experiment 2 for Experiment 1 the case studies group had no additional

effect on critical thinking skills, but the opposite result was found in Experiment 2 where the case studies had a significant effect on critical thinking skills.

As mentioned above, there was no significant change in the case studies group on critical thinking ability on Experiment 1. The possible reason might reflects to large gap in cognitive recognition and practice toward some new information. Adding some new information to existing information, in some circumstances, may initial require significant reorganization. Therefore this process might be difficult for student to adapt, moreover with the lack of training in previous education on how to adjust new information with prior knowledge, student might face some difficulty. Furthermore, among the benefits that the case studies method provides like promote and facilitate active learning, problem solving, and encourage the development of critical thinking skills (Popil, 2011), it also provides some of the implemental problems. For example, cases might not effective as a tool for students' to learn new information; this may make it difficult to apply case studies in introductory courses. However, in Experiment 2, before the research was started, the participants had already attended all courses for two weeks, unlike in Experiment 1 where participants had just begun the first week of a new semester. We suspected that after following the lectures for two weeks, participants in Experiment 2 received some basic knowledge. Student started to adapt to the learning process which helps participants in building knowledge structures, to get full understanding of a new concept often requires a lot of practice (Donovan & Bransford, 2005).

As mentioned in previous research (Whitaker, Gonya, Hein, Kroening, Lee, L Lee, Lukowiak & Hayes, 2009) the effect of the assessments that we used in this research, especially for the Cornell Critical Thinking Level Z test, required a complex critical evaluation and elaboration rather than simply recall or just simple identification therefore the interpretation of these test might quite difficult to be done by students. Meanwhile, because case studies teaching involves skills like solving problem and organize of group discussion,

that might commonly integrated into other coursework in the semester, we suspected students might lack opportunity to apply the case studies method since others course might not use the same method. On the other hand, instructing for critical thinking also need time that also follow by appropriating practice and curriculum activities that can manage student chance to develop their thinking ability. Therefore, it is important to provide training in the right timeframe to ensure participants know the details of activities that must be done in the learning process

Research question four investigated the effect of students presented with a case studies on the scores of University of Florida Engagement, Maturity and Innovativeness (UF-EMI) test compared to the Control Group. Based on the result of the UF EMI test, the pretest data had mean scores for the case studies group (M= 102.76, SD = 9.27) that were higher than the Control Group (100.24, SD = 6.83) However for the posttest the case studies group showed improvement that was almost same as the Control Group. The case studies participants' lower scores for the Cornell Critical Thinking Level Z and UF EMI test might relate to differences in previous life experience, which could have impacted to the difference in critical thinking skills and disposition obtainable score during the course of this study. This might be the cause of UF-EMI reflecting not only CT disposition but also social desirability, that is, students might have a tendency to show themselves to be desirable to teachers. Further examination is needed to clarify underlying mechanisms and determinants of changes in UF-EMI.

Furthermore, it is important to assess the performance of each student activity on performance when conducting activities related to case studies and concept mapping. Therefore the result will be more specific on how case studies can be contribute to an increase in critical thinking skills and disposition for each student.

Research question six was intended to verify whether a group of students who receives preparatory training via a case studies performed better on the Cornell Critical Thinking Level Z test compared with the case studies and the Control Group. Based on the mean scores, in the

pretest, the case studies with preparatory training group show the higher score on the Cornell Critical Thinking Level Z test (M = 16.34, SD = 5.64) compared to the other groups. However, the post-test result showed that the case studies improved CT skills (M= 20.44, SD = 4.03) but the preparatory training had no additional effect (M= 24.57, SD = 1.96).

Even though some studies have shown the effectiveness of training or simulation of case studies on improving critical thinking (e.g : Chiang and Chan 2013 ; Shin & Kim, 2014), there is also some research which has reported on the ineffectiveness of training methods on critical thinking (Eun & Young, 2014; Shin, Ma, Park, & Sun, 2015; Shinnick & Woo, 2013). Maneval, Fowler, Kays, Boyd, Shuey, Harne Britner and Mastrine (2012) investigated the effect of simulation training on the critical thinking of a group of nurses and reported even experiment and control groups showed an increase in critical thinking scores from pretest to posttest, however, neither group showed a statistically significant increase in mean test scores. The effect of simulation on critical thinking and clinical decision-making skills remains unclear. In a study by Shin et al. (2015) found the gains in students' critical thinking scores varied according to their numbers of exposures to the simulation courseware. Further, with a single exposure, there were no statistically significant gains in critical thinking, whereas three exposures to the courseware produced significant gains in critical thinking, the more often students engage in training or situations that require them to use thinking skills will help promote critical thinking. In the current research, students that train with preparatory training might have had trouble with time management, unlike the case studies combined with concept maps aided by using the FreeMind application to visualize their ideas, the case studies with preparatory training group might have experienced some barriers to transform their ideas within the limited time. Research by Shinnick, Woo and Horwich, (2009) mentioned that simulation or training is a time and cost intensive teaching approach that consists of both hands-on experience and a debriefing session. However as mentioned before in this study, participants

only had one training regarding the case studies activity, since the participants are the first year student they might need more time to adapt the new method of learning. Further research is needed to clarify this matter.

Research question seven was intended to verify whether a group of students who receive preparatory training prior to the case studies perform better on the UF EMI test compared with the case studies and Control Group. The UF EMI mean result, in the pretest for the case studies with preparatory training group was M = 93.48. For the posttest there was also some increase in the score with case studies with preparatory training (M = 96.35) however it is not really significant, meanwhile the Control Group had no additional effect on critical thinking score. We suspected that disposition toward critical thinking depends largely on people's character and their upbringing and childhood, and might easily be altered. We speculate that since the participants in this research were 1st year students and the topic *Introduction to Psychology* was fresh and exciting for them, therefore even participating in standard lecturing class, students might feel motivated and engage with the learning process. This might lead them to change their critical thinking *disposition,* even if it was not enough motivation to change their critical thinking *skills*.

Meanwhile, we also found hard to eliminate the possible effect of social desirability among students. The instruments that we used in this research might not be robust to student manipulation; some students might answer dishonestly in order to "fit in" with the perceived social conditions. Although, before filling out the instrument, students were reminded that the score would not affect their final score in the class. It is possible that some students still considered it important to show good scores on this task. In contrast, the Cornell Critical Thinking Level Z test required deep thinking and analysis to solve a case and students could not pretend to be critical thinker is they had not acquired new skills.

Research question eight examined whether the students exposed to the case studies with concept maps had better engagement and performance in learning activity compared to other groups. The results showed that student activity was higher in the case studies combined with concept maps compared to other groups. This research suggests that the environment where the case studies with concept maps was applied positively impacts student participation and motivation in the learning activity. Additionally, students construct new meaning through group discussion by clarifying and questioning statements among their member group, student might develop ideas and new during deep learning process. By presenting content in the format of a case while creating concept maps students or motivated to make questions, promote group discussion and engage deeper learning and skills to solving the problem.

Finally, case studies combined with concept maps help students increase intrinsic motivation over time as showed by an eagerness to apply their new learning using Freemind Application and discussing section with friends. Case studies facilitate development of critical thinking, learning, and participation among students, especially in terms of the ability to view an issue from multiple perspectives and to grasp the theory with the application of core course concepts.

5.1.2 Additional Discussion

This section discusses the effect of the case studies with concept maps and the case studies with preparatory training toward the initial of low and high critical thinking skills and dispositions. Based on the Experiment 1 analyses we suspected that there is an influence of the initial score of critical thinking to the improvement of critical thinking skills and dispositions. In Experiment 1, for the Cornell Critical Thinking Level Z test, the pretest mean for all groups was high (M = 30.33), while for Experiment 2 the mean for all groups in the pretest was lower (M = 14.07). Meanwhile, for Experiment 1, the mean for all groups showed

UF EMI score in pretest was high (M= 100.82) and for Experiment 2 it was lower (M= 93.48).

This result shows that for the groups with initial low skill critical thinkers, the case studies with concept maps, the case studies with preparatory training and the case studies has a positive contribution on improving critical thinking skills, compared to lecture-based learning Control Group which had no effect on improving critical thinking skills. Meanwhile, for the initial high skill critical thinker, the case studies with concept maps also had a significant effect on improving critical thinking skills. But for the initial high score critical thinkers, the case studies with preparatory training and case studies may have helped maintain the critical thinking skills, although there was no discernable improvement. In contrast, for the initial high skill critical thinkers, the lecture class was not effective at improving critical thinking skills.

This finding adds some novelty to this research, while other research has focused on specific methods that effect critical thinking skills and dispositions, research focusing on how the method effectiveness differs between the initial low and high critical thinking groups is not commonly reported. During solving a problem or case the initial high critical thinking skills, giving some ideas toward the case, however, the idea is might only on ordinal level therefore it not really significant improving their critical thinking skills. This might be because the initial high critical thinking students found the case studies not challenging for them and therefore they did not put as much effort to solve the case. However, for students with initial low critical thinking skills this ordinal idea is enough to help them improving their critical thinking skills By assigning more points and making the learning activity more challenging like asking student to visualize idea using application it would have encourage the motivation of the initial high critical thinking skills to present more innovative and creative ideas that help them improve their critical thinking skills.

For students of the initial high critical thinking disposition, CS with preparatory training, CS, and control group treatment was significantly decrease critical thinking disposition. By

contrast, CSCM treatment was shown to be effective to maintain critical thinking disposition even for the students of initial high critical thinking disposition. Meanwhile for the initial low critical thinking disposition the case studies with concept maps, the case studies with preparatory training, the case studies only and the lecture class (control) group had a positive contribution on improving critical thinking disposition. We suspected that during the discussion on solving a case, the initial high critical thinking disposition is not feel challenged on giving their best idea, therefore this effect their attitude and became barrier to develop critical thinking disposition.

5.2 Summary for Conclusions

The main findings of this investigation summarized as follows:

a. By developing a case studies with concept maps improve critical thinking skills to help students make a visual scheme to solve the case studies.
b. The mean analyses suggested that the case studies with concept map users had significantly higher critical thinking affective dispositions compared to the other methods.
c. There was no significant difference found between the case studies group and the Control Group, even though the mean score of case studies show some improvements.
d. In the pretest, the case studies with preparatory training group showed the higher score on the Cornell Critical Thinking Level Z test compared to other groups. However, the post-test result showed that the case studies improved CT skills, but the preparatory training had no additional effect.

e. For the UF EMI result, the pretest mean for the case studies with preparatory training (M= 93.48) and for the posttest there was some increase in the mean score with the case studies with preparatory training (M = 96.35) however it was not significant.

f. For the initial low skill critical thinkers, the case studies with concept maps, the case studies with preparatory training and the case studies had a positive contribution on improving critical thinking skills, unlike the lecture-based learning Control Group that had no effect on improving critical thinking skills. Furthermore, for the initial high skill critical thinkers, the case studies with concept maps also had a significant effect on improving critical thinking skills.

   However, for the initial low disposition critical thinkers, the case studies with concept maps, the case studies with preparatory training, the case studies alone and the lecture class (control) group had a positive contribution on improving critical thinking **disposition**. For the initial high disposition critical thinkers the case studies with concept maps also had a positive effect on maintaining the critical thinking disposition. However, in a contrast finding for the initial high disposition critical thinkers, the case studies with preparatory training, the case studies and the lecture class seemed to have a negative effect on improving critical thinking skills.

5.3. Limitations

Efforts were made to minimize the study limitations, although some were unavoidable. The results of this study refer to the population presented and cannot be summed up to the aggregate to the whole population of college students. The sample size was relatively not really big for Experiment 1 (N = 75) and Experiment 2 (N = 115) and the research was conducted only one single institution. Replication with different populaces would help confirm these investigation result.

Others variable that difficult to be controlled is life background. These differences can affect the baseline of critical thinking as we mentioned before. The researchers also felt that the time spent in training for the concept maps and the preparatory training activities, as well with the session class was probably too brief. The limitation of this study might also regarding the assessment instruments. Even though, the instruments selected were carefully chosen from among all available assessment and seemed match with the criteria and purpose for the study, there is still more effort to improve present instruments as well as to develop additional instruments that sufficiently measure students' critical thinking skills and dispositions.

Limitations of this research include the modest sample size (Experiment 1 include 3 groups with students and the Experiment 2 include four group with 115 students), furthermore due to administrative reasons and time constraints students could not be randomly assigned to the treatment or Control Groups. The short-term of instruction was obligated by the Faculty semester system, therefore in this study the treatment in the experimental model was done as intensively as possible within the required subject material.

The Hawthorne Effect also might contributed on limitation of this study. The Hawthorne Effect defines as conditions where the participant is aware of participating in an experiment improves performance (Gall, Borg, & Gall, 1996). At the beginning of the treatment, each participants on Experiment 1 and 2 were informed that they were participating in a research study. However, students were not told whether they were placed in a control or an experimental section nor do the design of experiment, thus the Hawthorne Effect might affected all groups equally. Meanwhile for UF-EMI instruction, we emphasize to students that the UF-EMI test result is not related to the final grade of the course, so that students are asked to respond according to the actual circumstances. The consistency of treatment approach and quality across all meeting was assumed quite high, since the researcher was same in all sections in Experiment 1 and 2 in this study. In the Experiment 2 "Student Activity Observation Sheet"

forms were used for monitoring the student activity during the experiment. The researcher asked helps from additional rater to fill the observation instruments to check for student activity in each group in Experiment 2.

5.4. Recommendation

5.4.1 Recommendation for Practice

This examination was directed in a naturalistic instructive setting with a several number of the factors commonly found in a community college course, including students with a lot task and heavy schedule. Despite these challenges, the result of this study to investigate the effectiveness of the case studies with concept maps for critical thinking in improving students' abilities and disposition to think critically contribute important implications for certain groups of people, including educators, business leaders, and society. Training students to think critically is among the principal tasks of the educational system that need to be done. In working life and society demand's the ability to analyzing complex issues and conditions creating solutions, making connections between prior and new contexts, and developing standards for decision making, therefore is crucial to include critical thinking as the purpose of learning.

For teachers, understanding both the idea of figuring out how to think critically and strategies for guidance are essential. Some evidence showed that just attending classes also improve student abilities to think critically. However, much evidence, including this study result, shows that if we want to encourage students to think critically, we must teach and facilitates them on learning atmospheres that allow them to freely using their ideas. Similarly, to improve as critical thinkers, students must be taught and practice how to use components of the specific method that helps in analyzing problems and facilitates students to express ideas.

Student also need to be clarify the importance of critical thinking and some demonstrations of critical thinking and the positive effects of critical thinking.

In the present research we found high heterogeneity among students with wide distribution of initial low and high critical thinking skills and disposition. One way that can be done is by conducting an initial assessment of the ability to think critically and then determining the right strategy for student. Others ways by made to design specific instruments and scenarios that able to cover differences in thinking critical thinking skills and dispositions. The next implication of this research is the importance to include teaching critical thinking in the curriculum, not only on single subject matter.

As we mentioned in chapter one, many institutions highlight the urgency of integrating critical thinking as one of the education goals at all educational levels and across the curriculum. A curriculum in which they are active participants engaged in democratic and cognitively challenging tasks for students works better. Helping students in maximizing their chances to learn and solve a problem in all situations and to create a relevant academic lessons to daily conditions is essential for meeting many of the main goals of our educational system. Businesses market demand high level thinking abilities of their employees, therefore business sectors need to working together with society, and education institutions to integrate explicit instruction in critical thinking into all levels of schooling in all academic areas.

To relate this study back to the conditions outlined at the beginning. Indonesia consists of a pluralistic society with different tribes, religions, and cultures, which requires citizens who can objectively evaluate the information that they received with different perspectives. Critical thinking enables individuals to participate in democratic life by weighing options, taking alternative views into consideration, and gathering information to make informed and reasoned decisions towards information issued by both individuals and business entities through social and electronic media. By thinking critically, we have the opportunity to explore ideas, question

underlying assumptions, interact in meaningful ways with texts and participate in construction of knowledge therefore society can choose whether one news is true or just a fake news. Such learning activities counteract narrow conceptions of learning as merely knowledge acquisition, and serve as counter-measures to indoctrination. If our aim is education, that is authentic learning, autonomy and co-construction of knowledge rather than indoctrination, memorization and control, then critical thinking ought to increase the possibility of education for democracy. Hence, there rests an intricate connection between critical thinking and education for democracy. Some scholars also suggest a moral reason for the importance of critical thinking in a democracy, if we conceive of students as subjects and not mere objects, then we have a moral responsibility to present them with opportunities to engage in critical thinking and exercise their autonomy. Democracies require informed reflective citizens, those who possess the skills and dispositions associated with critical thinking and use them appropriately within the context of democracy.

5.4.2 Recommendations for Further Research

Students in this research were taught to use the case studies with concept maps and the case studies with preparatory training for improving their critical thinking skills and dispositions. One possible area of research for a follow-up study is on students who participated in this study or with other participant's to see if students taught the preparatory training multiple times (more than eight meeting and with more than one meeting training) demonstrate a persistent effectiveness of critical thinking. The research that used preparatory training of the case studies activity might be the first empirical study conducted for critical thinking, therefore replication is clearly needed.

Although the result of this study showed the significant benefits from integrating case studies with concept maps on improving critical thinking skills however for critical thinking

disposition, the method seemed to have no additional effect on critical thinking disposition. However, we were not able to create conclusions as to whether the ineffectiveness was due to the method or the assessment that we used for measuring critical thinking disposition, in this case the University of Florida Engagement, Maturity, and Innovativeness test. Further study needs to be done to answer whether other assessments for critical thinking disposition show similar results and to determine which test is the most efficient indicator.

Others things that also important to noted, due the limited times on conducted the experimental study (eight week), the researcher did not give the final score to the experimental participants. Researchers only provide mid-term score, whose results are left to other lecturers who continue to teach the Introduction to Psychology course. Therefore, the possible effect of case studies combined with concept maps, case studies, and preparatory training treatment on acquiring course contents (knowledge of basic psychology) is not assessed in the two experiments. Therefore, further examination need to clarify this matter.

This study used the same measuring instruments for pretest and posttest. Some experts argue, that using same instruments for pretest and posttest can provide a "remembering effect" when answering the instrument at the posttest. Thus, the posttest results are not only caused by treatment, but the effect of learning or remembering through pretest. However, Cornell Critical Thinking Level Z has a fairly high level of difficulty and not too much time on finishing the test (52 item with 50 minutes). In this experiment, we also involve control group, which based on analysis there is no significant improvement on critical thinking skills after the treatment (lecturing class only) for control group. Therefore, we draw conclusion that the improvement on critical thinking on experimental group is based on treatment effect. Besides the researcher did not provide an explanation at the pretest if it would be posttest, hence students were less likely to try remember the content of the test and find correct answer after the pretest. Futher, student do not give correct answer after the pretest. In addition, with an interval of almost 8

weeks and other task from other courses, high possibility students will have difficulty remembering the questions and answers they have chosen on pretest.

There is another way to constructing pretest and posttest by split instrument for pretest and posttest, therefore the instrument will be different for each assessment time. However, before being use at the pretest and posttest, it is necessary to do a number of things to ensure that the instruments are equal and measure the same indicators at each time. Although we repeat this instrument, we evaluated the effect of treatment in comparison with the control group that received the repetition of the identical test. Therefore, our evaluation of treatments must not be attributed to effect of repetition of the identical test.

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